Maintenance Manual

Extensa™ 900 Series Notebook Computers

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Texas Instruments

Extensa™ 900 Series Notebook Computers
Maintenance Manual
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Preface

Introduction

This manual provides installation, operation and servicing data for the Extensa™ 900 Series Notebook Computers.

Intended Audience

This manual is primarily intended for use by qualified service technicians but contains information useful to non-technical users.

Contents

This manual contains six sections and one appendix that are common to all Extensa 900 Series Notebook Computers (differences described as they are covered):

- **Section 1: General Description -** Introduces the main features of the Extensa 900 Series Notebook Computers; identifies all options, provides physical and electrical specifications.
- **Section 2: Installation -** Describes how to unpack, install options and begin using the notebook.
- **Section 3: Operating Instructions** - Describes the notebook computer operating controls and indicators and basic operating procedures required to support maintenance operations.
- **Section 4: Theory of Operation** - Provides a block diagram level theory of operation for the Extensa Series Notebooks.
- **Section 5: Troubleshooting Procedures** - Provides troubleshooting procedures for the notebook computer series.
- **Section 6: Field Service** - Provides preventive and corrective maintenance procedures for the notebook computer series including FRU removal/ replacement procedures.
- **Appendix A: Notebook Schematic Diagrams** - Provides schematic diagrams for the Extensa 900 Series Notebook Computer.
- **Appendix B: MPB Schematic Diagrams** - Provides schematic diagrams for the Extensa 900 Series Mobile Productivity Base.

Other Manuals About the System

The following documents provide additional information related to the Extensa Notebook Computer Series:

- *Extensa Series Notebook Computers Users Guide* - Contains user reference information for the Extensa 900 Series Notebook Computers.
- *PC-Doctor Help* and *Technical Reference* (online)

Ordering Parts and Supplies

To order a copy of any TI publication or to order option kits, spare parts or supplies for your system, contact your TI reseller:

Telephone Toll-free: **1-800-TI TEXAS**.

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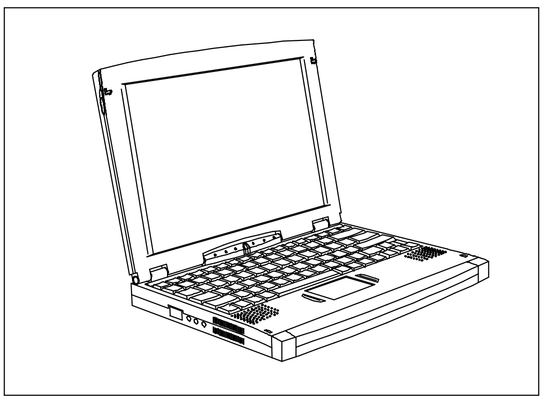
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1
General Description

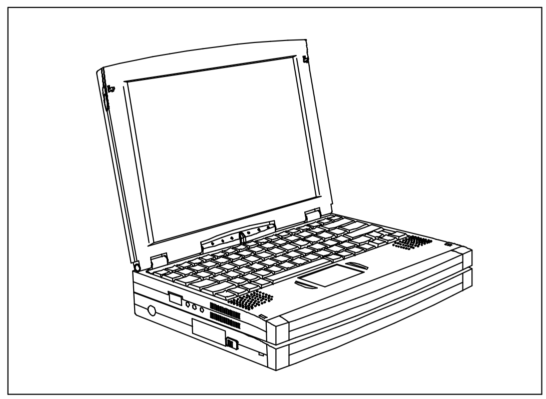
1.1 Introduction

This manual contains field and factory level servicing information for the Extensa™ 900 Series Notebook Computers (Figure 1-1) marketed by Texas Instruments. This section provides a general overview of the Extensa 900 Series, describes the standard and optional features, and identifies the major assemblies and subassemblies. This section also contains detailed functional and environmental specifications for the Extensa 900 Series Notebook Computers.

Figure 1-1 Extensa 900 Series Notebook Computers



Basic Extensa 900 Series Notebook



Extensa 900 Series with Mobile Productivity Base

1.2 Product Overview

The Extensa 900 Series Notebook Computers are ultra-slim, large screen, high-performance, multimedia notebooks powered by the Intel® P54CSLM Pentium® Processor Chip (133-MHz). The Extensa 900 can be equipped with an optional Mobile Productivity Base that allows for quick connect/disconnect to/from the desktop environment and expanded functionality (modular bay and Advanced PCI card features).

Other major features of the 900 Series include:

- 133 MHz Pentium processor with internal 256 KB cache memory and math coprocessor

- Powerful PCI Bus architecture
- 16 MB main memory (expandable to 80 MB using 8 MB, 8 MB, 16 MB, 32 MB or 64 MB EDO 64-bit type small outline dual inline memory module (soDIMM) upgrades)
- 256 KB Level-2 cache memory
- Built-in 2.5-inch IDE high capacity (1.35 GB or greater) Hard Disk Drive
- External Floppy Drive Module (attaches to the Parallel Port)
- Advanced video features
  - DSTN or TFT internal color display
  - Simultaneous display with external CRT
  - 2.0 MB video memory
  - Fast video graphics accelerator
- Built-In 86/87-key keyboard
- Internal touchpad pointing device with two Select buttons
- Fast Infrared communications
- Built-in audio features
  - 16-bit stereo audio
  - Line In, Line Out and Microphone In stereo jacks
- Small, lightweight AC adapter, auto-switching (90 VAC to 264 VAC, 50-60 Hz)
- Portable power system with advanced power savings features for extra long battery life
  - Zero-Volt Suspend, 5-Volt Suspend and Standby power saving modes
  - Rechargeable Li-Ion battery pack
- Powerful expansion capabilities including:
  - Flexible set of desktop ports including external CRT (and simultaneous LCD and external CRT display), 9-pin serial port, parallel port for external printer/floppy drive, PS/2® port for external keyboard or mouse
  - PC Card slots for two Type I or II options or one Type III option
  - Mobile Productivity Base ready

Figure 1-2 identifies the major external notebook features.

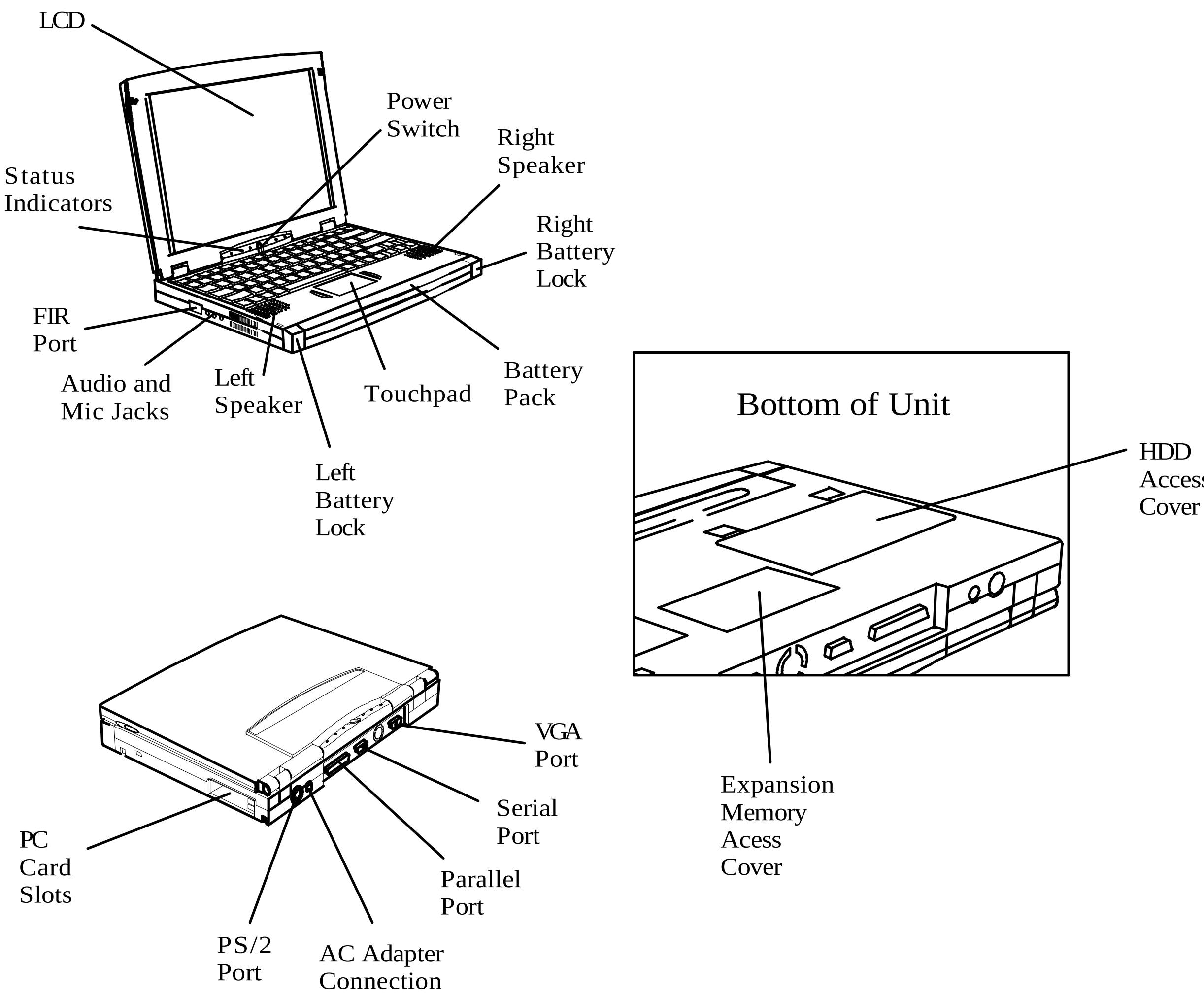


Figure 1-2 900 Series Notebook External Features

1.2.1 Video Display Features

The Extensa 900 Series Notebooks contain large screen internal LCD displays and can simultaneously drive the internal LCD and an external CRT (SimulSCAN™ mode). On all Extensa models, the LCD screen brightness, contrast, video mode of operation, etc. are adjustable from the keyboard as described in Section 3.

1.2.1.1 Internal LCD

The Extensa 900 Series Notebooks contain one of the following LCDs (model dependent):

- ♦ 12.1-inch DSTN display (900CD Only)
- ♦ 11.3-inch TFT

1.2.1.2 External CRTs

The Extensa 900 Series Notebooks are equipped with a 15-pin SVGA connector that can drive an external CRT (either alone or simultaneously with the internal LCD).

When the notebook is set to the SimulSCAN mode, a minimum resolution of 800 x 600 x 256 colors is supported. When operating in the External CRT Mode, resolutions up to 1280 x 1024 x 256 colors are supported.

1.2.1.3 Display Hot Key Sequences

The display mode of operation (LCD only, Simultaneous LCD and external CRT and external CRT only modes) is keyboard-selectable using the following hot key sequences.

- ♦ **Fn-Up Arrow** and **Fn-Down Arrow -** Control LCD screen brightness (higher brightness setting uses more battery energy)
- ♦ **Fn-Right Arrow** - Lightens the LCD screen contrast
- ♦ **Fn-Left Arrow** - Darkens the LCD screen contrast
- ♦ **Fn-F12** - Alternates between display modes (LCD, External CRT or both)
- ♦ **Fn-F11** - Turns off the LCD backlight; pressing any key turns the LCD backlight on.

Note: In addition to the hot keys that control the notebook display functions, there are several other hot key functions that control other notebook functions such as turning the Touchpad on/off, etc. For these sequences, refer to Section 3.

1.2.2 Keyboard Features

The Extensa 900 Series Notebooks contain a built-in 86/87-key keyboard (Figure 1-3) compatible with the IBM® enhanced 101/102-key keyboard. The keyboard contains 12 programmable function keys, an embedded numeric keypad (Figure 1-4) and dedicated control keys (hot keys).

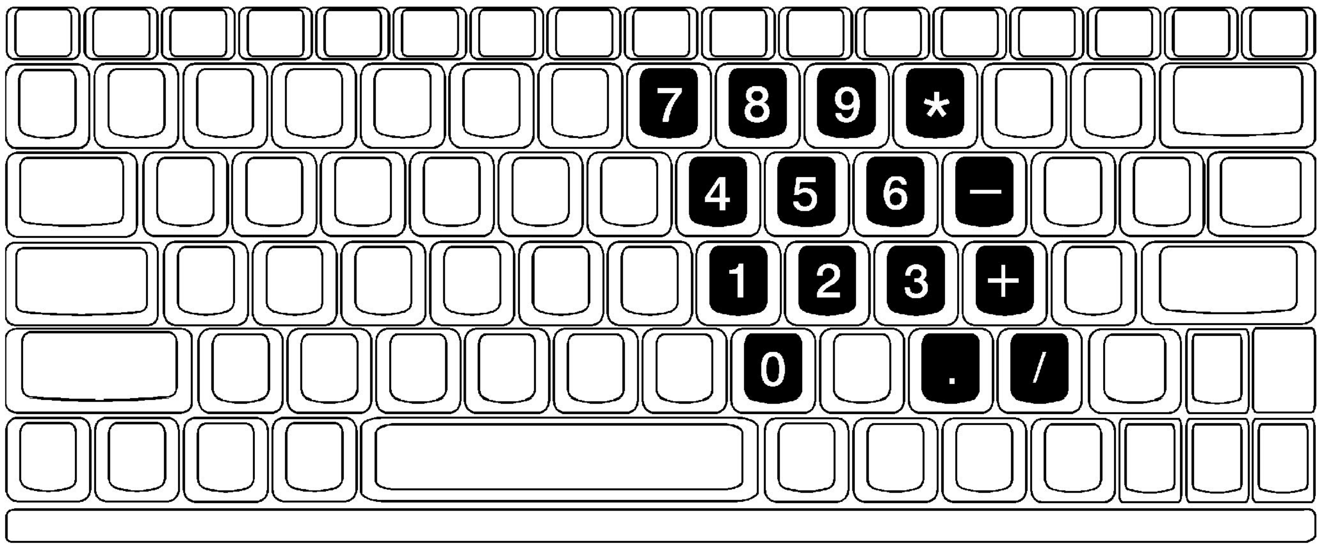


Figure 1-3 Embedded Numeric Keypad

1.2.3 Software Features

As a standard feature, the Extensa 900 notebooks are factory loaded with dual load (Windows® 95 or Windows for Workgroups) software to allow the user to configure the notebook's operating system environment as summarized in Table 1-1.

Table 1-1 User-Selectable Operating System Environments

Operating System	Description
Windows 95	Supports both desktop and mobile operation with Plug N Play capabilities and Advanced Power Management; customized to include TI startup screen, CSL Support information, Internet browser, multimedia options, and choice of wallpaper to customize different computer resources, TI utilities such as wBattery, wSetpower, TISetup, variety of device drivers including Cirrus® CL-GD7548, ESS 1888 Sound Device Drivers, WinModem Device Drivers, PC-Card Bus Socket Services and Card Services Device Drivers, and Windows 95 MPEG-1 Software Audio/Video Compression Device Drivers.
Windows/DOS 6.22	This environment has some limitations in the Plug N Play area; includes TI utilities and various device drivers including Cirrus CL-GD7548, ESS 1888 Sound Device Drivers, WinModem Device Drivers, PC-Card Bus Socket Services and Card Services Device Drivers, etc.

1.2.4 Standard Peripheral Devices

As standard features, the Extensa notebooks include an internal IDE hard drive, an external 3.5-inch floppy disk drive and built-in touchpad (mouse device).

1.2.5 900 Series Connectivity Features

As standard features, the Extensa 900 Series notebooks includes most standard desktop ports including a serial port, parallel port, PS/2 port, and external VGA port. The 900 Series also includes a fast infrared (FIR) port and an expansion bus connector for attaching to the optional Mobile Productivity Base. The external ports for the 900 Series are shown in Figure 1-4 and described in Table 1-2.

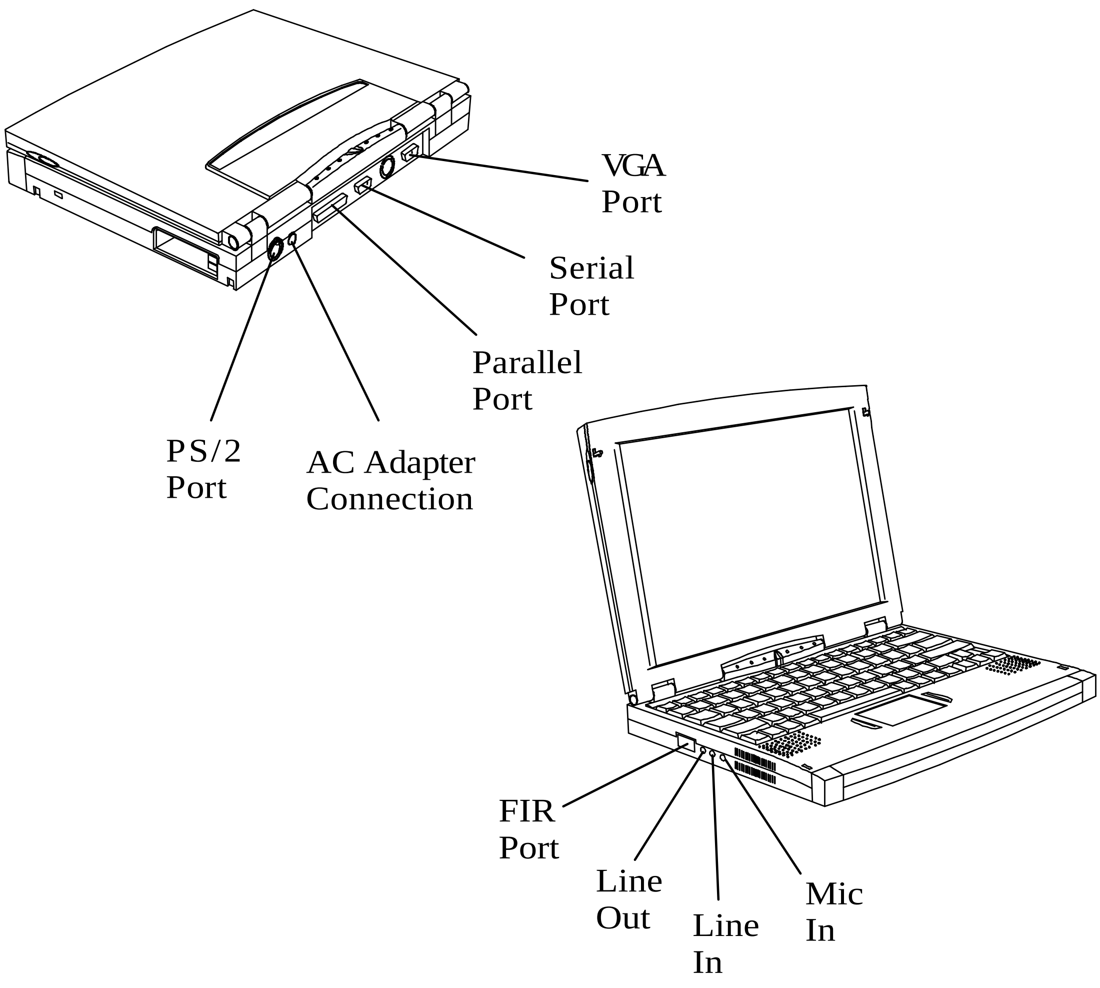


Figure 1-4 900 Series External Ports

Table 1-2 900 Series External Ports

Port Assignment	Description
External VGA Port	15-pin Female connector used to attach an external SVGA monitor to the notebook.
Serial Port	9-pin Male connector used to attach an RS-232 serial device to the notebook.
Parallel Port	25-pin Female connector used to attach a bidirectional printer or an external floppy disk drive (requires special cable for use with floppy disk drive).
PS/2 Port	6-pin Circular connectors used to attach external keyboard/mouse devices to the notebook.
AC Adapter Connector	Power in connector used to attach the output of the AC adapter to the notebook.
Fast Infrared Port	Fast Infrared Port (4 M/b) used for wireless communications between the notebook and an FIR-equipped device such as keyboard, another notebook, printer, etc.
Audio In/Out, Mic In Jacks	Stereo audio line inputs, stereo line outputs and external microphone input
MPB Bus	PCI Bus plus sidebands that support an optional Mobile Productivity Base.

1.2.6 Notebook Expansion Capabilities

In addition to the external ports, the Extensa 900 Series Notebooks are designed with a variety of expansion features that permit substantial functionality and performance upgrades over the life of the product. The expansion capabilities built into the notebook are summarized in Table 1-3 and described in greater detail in the following paragraphs.

Table 1-3 Extensa 900 Expansion Features Summary

Expansion Feature	Description
External 3.5-inch Diskette Drive Module	Provides convenient storage on a removable diskette format
Memory Expansion Features	Main memory can be expanded from 16 MB to a maximum of 80 MB using one soDIMM module (8 MB, 16 MB, 32 MB, or 64 MB configurations).
Flash ROM (hardware feature)	Permits new versions of BIOS to be downloaded into Flash ROM without physically having to replace the ROMs
PCMCIA Slots	Allows installation of any optional PCMCIA device such as speakerphone modems, Ethernet® cards, and full motion video cards.
Mobile Productivity Base Ready	Connectors and latch mechanisms to accept a Mobile Productivity Base (provides desktop connectivity with quick removal/installation feature required for combination desktop and portable environments and increased functionality including media bay and Advanced PCI Card support).

1.2.7 Memory Expansion

The notebook comes standard with 16 MB of RAM expandable to a maximum of 80 MB using soDIMM modules (available in 8, 16, 32 or 64 MB sizes). Access to the expansion socket is accommodated via a removable panel on the bottom of the notebook as shown in Figure 1-5.

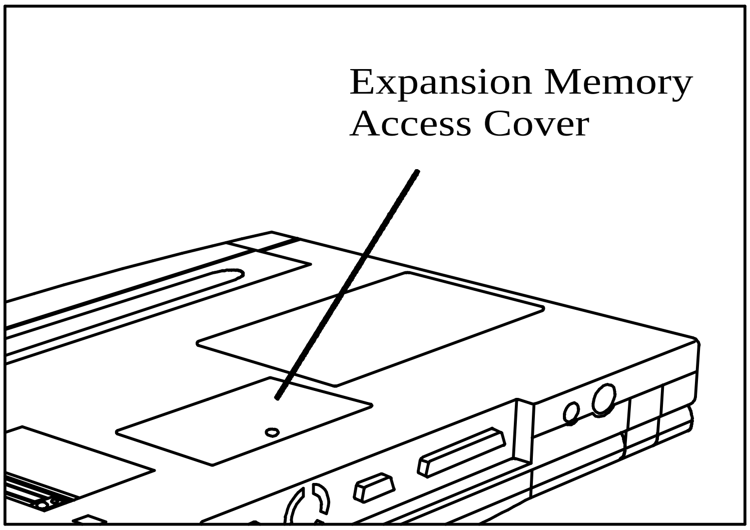


Figure 1-5 Memory Expansion Features

1.2.8 PCMCIA Card Options

The Notebook contains an onboard PCMCIA Controller and two 64-pin sockets that can accept up to two credit-card size (14.5 mm) Type I or Type II PCMCIA option cards or one Type III card. The PCMCIA Card options install on the left side of the notebook (Figure 1-6) and are removed using the PC Card Release levers.

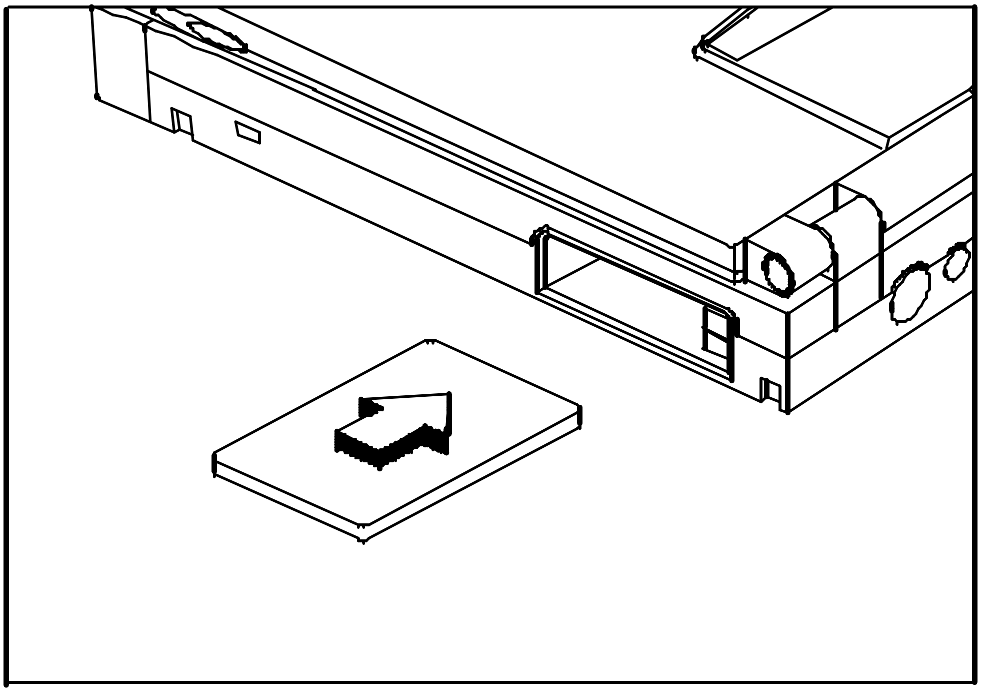


Figure 1-6 Installing PCMCIA Card Options

1.2.9 Mobile Productivity Base Option

The Mobile Productivity Base (Figure 1-7) provides a port replicator function with separate External Keyboard and Mouse ports, plus powerful desktop expansion features including a Modular Bay for CD-ROM or Floppy Disk Drive and provisions for an Advanced PCI Card option. These features are summarized in Table 1-4.

Table 1-4 Mobile Productivity Base Expansion Features

Expansion Feature	Description
Media Bay CD-ROM Drive	Reads from Audio CD, Photo CD or CD-ROM
Media Bay 3.5-inch Diskette Drive Module	Provides convenient storage on a removable disk format
Advanced PCI Slot	Provisions for installing one Advanced PCI Card
Secondary Battery Option	Provides for extended portable operation time

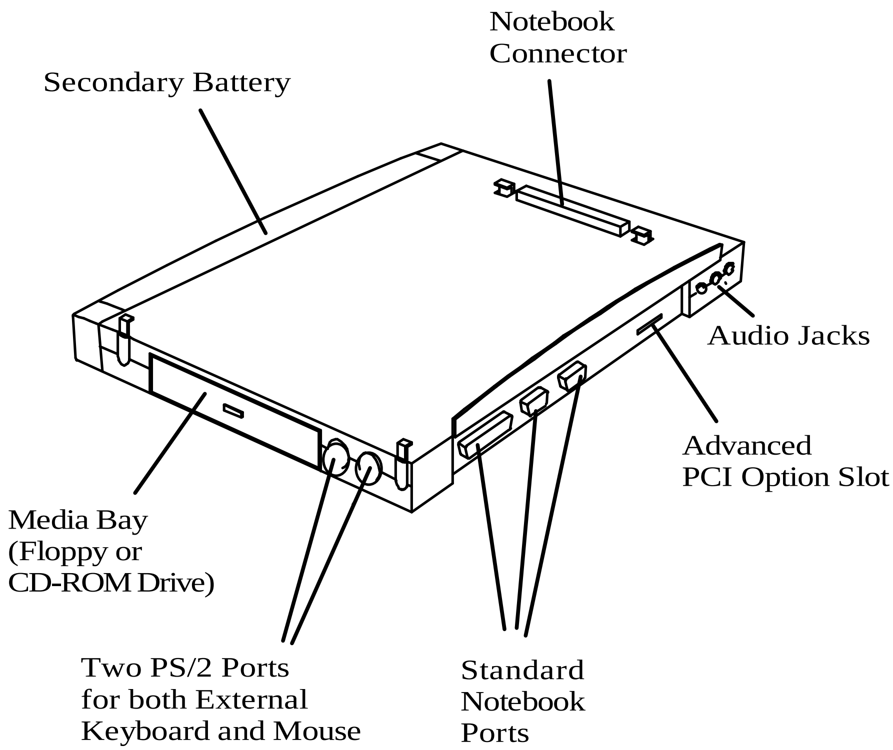


Figure 1-7 Mobile Productivity Base (MPB) Features

1.2.9.1 Docking and Undocking

Docking and undocking of the Mobile Productivity Base is controlled by a latch and lever on the left side of the base as shown in Figure 1-8. The latch releases the lever; the lever is extended 90 degrees outward to release the notebook.

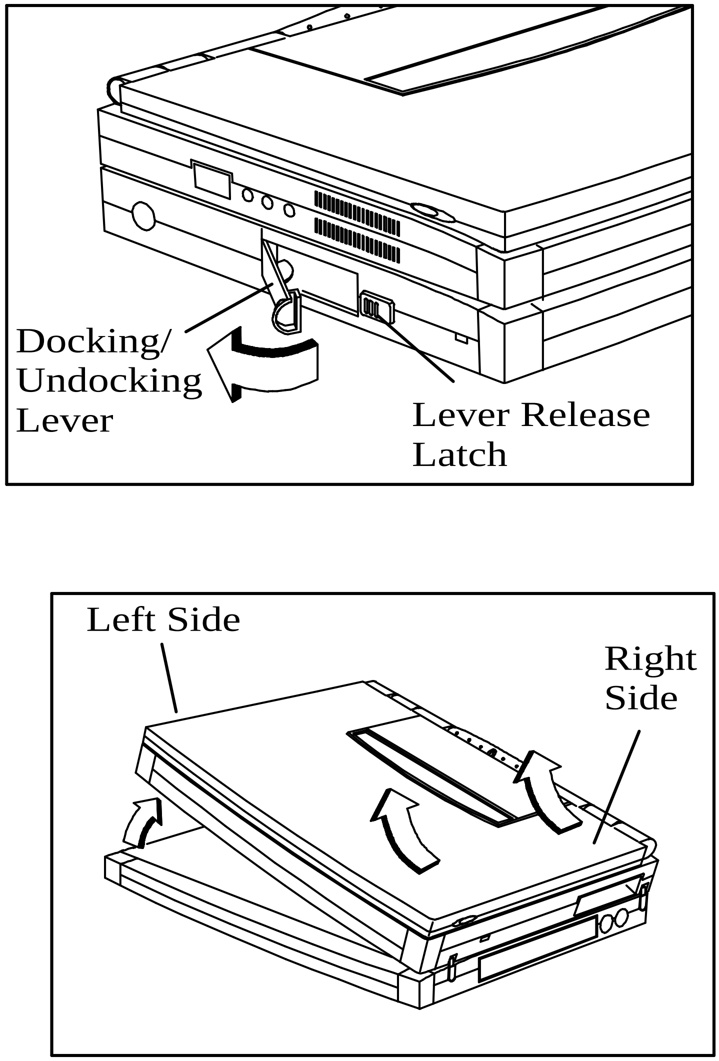


Figure 1-8 Undocking from the Mobile Productivity Base

1.2.9.2 Mobile Productivity Base Ports

The Mobile Productivity Base provides the same ports as available on the Notebook plus an additional PS/2 port to allow for both external mouse and keyboard. The port assignments are shown in Figure 1-9.

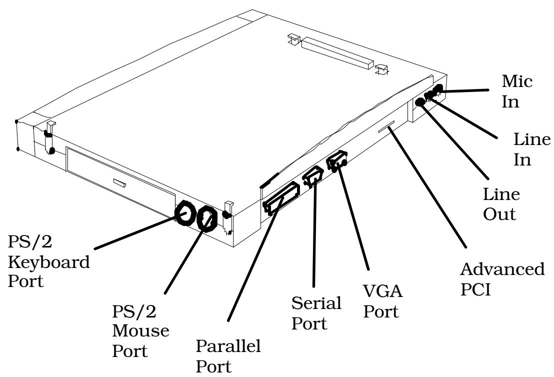


Figure 1-9 Mobile Productivity Base Ports

1.2.9.3 Advanced PCI Card Options

The Extensa 900 Series Notebooks contain provisions for an advanced PCI Card as shown in Figure 1-7.

1.3 Notebook Battery

The notebook computer uses a Lithium-Ion battery pack. A second identical battery can be installed in the optional Mobile Connectivity Base as shown in Figure 1-7.

1.4 Standard Test Features

The Extensa 900 Series Notebook Computers use modular design and built-in test features to reduce the mean time to repair. A power on self test program automatically verifies the operational state of the primary circuits and a powerful suite of diagnostic tests (known as PC-Doctor) are available to further test selected parts of the system.

1.4.1 Power On Self Test

The Extensa line of notebook computers contain a BIOS-resident, Power On Self Test (POST) that automatically performs a test of memory and all major circuits each time

the computer is powered up. In the event of a failure, the computer displays a descriptive error message and issues a series of coded beeps (in case the display subsystem is not functioning). If self test completes normally, the computer displays the amount of memory tested, loads the Operating System and Windows environment.

1.4.2 PC-Doctor Diagnostics Program

The Extensa 900 Series Notebooks are shipped with PC-Doctor for Windows, a powerful diagnostics tool that can help you scan a system for viruses, determine the hardware configuration of a local or remote system, benchmark its performance, analyze the performance of all subsystems, and perform a suite of interactive and non-interactive tests on attached devices (such as printers, VGA monitors, SCSI® devices, CD-ROM drives). The test results are stored in a log which can be printed out (by pressing **F2**) or saved in a disk file (by pressing **F3**).

Features of the diagnostic program are accessed through a series of pull-down menus and basic keyboard keys (cursor keys to move highlighted pointer, **Enter** key to select a highlighted feature, **Esc** key to cancel a function and move back one level.

PC-Doctor is typically user-friendly but if you don't understand a feature, context-sensitive help information is available at any time by pressing the **F1** function key; pressing the **F1** function key twice accesses the online Technical Reference Manual for PC-Doctor.

A powerful set of utilities within PC-Doctor (that can be run locally or remotely) simplify the task of determining system configuration data, allocating and using system memory, IRQ and DMA use, what device drivers are installed, what COM and LPT ports are assigned and what ports are available, identifying partitioning data for fixed disk drive(s), determining the VGA setup information, reading the software interrupts/ interrupt vectors, etc.

Note: Refer to *Troubleshooting Procedures* (Section 5) for additional information regarding the Diagnostics Program.

1.5 Extensa 900 Series Specifications

General specifications for the Extensa 900 Series Notebooks are provided in Table 1-5.

Table 1-5 Extensa 900 Specifications

Characteristic	Model 900 Series Specifications
CPU	Pentium P54CSLM, 133 MHz; 3.1 Volt,
Internal Hard Disk Drive	
Disk Storage Capacity:	1.35 GB or greater
Average access time:	12 ms or less
Throughput	11+ Million I/O's per second
DRAM Memory	
Size	16 MB DRAM, 60-ns, page-interleaved
Maximum Expansion Size	80 MB
Flash ROM:	256 KB
FDD	External
Disk Storage Capacity:	1.44 MB
Disk Size	3.5-inch disk
Drive Height	12.5 mm
Mode	Choice of 720 KB/1.2 MB or 1.44 MB
CD-ROM Drive	Available with Mobile Productivity Base option
LCD Display	12.1-inch DSTN, SVGA or 11.3-inch TFT, SVGA
Software	Dual Load
Internal Keyboard	86/87-key, PS/2 and AT-compatible Embedded Numeric Keypad
Key Travel	3 mm
Built-in Mouse Device	Touchpad built-in to the base of the keyboard (select buttons on sides of Touchpad)

Table 1-5 Extensa 900 Specifications

Characteristic	Model 900 Series Specifications
Video Subsystem	
LCD Aspect Ratio	1-1
Emulations:	SVGA
Video Memory Size	1.5 MB
Video Bus:	32-bits
LCD Resolution:	640 x 480 pixels bit-mapped at 256 colors
LCD Characters/Line	80
LCD Lines/Screen:	25
LCD Brightness Control:	Function hot key brightness and contrast control and SimulSCAN control
External CRT Monitor Interface	
Connector Type:	15-Pin, female, D-type connector
Monitors Supported:	640 x 480 with 16.7 million colors on CRT 800 x 600 with 65K colors on CRT 1024 x 768 with up to 256 colors on CRT

Table 1-5 Extensa 900 Specifications

Characteristic	Model 900 Series Specifications
RS-232-D Serial Port:	9-Pin, male, sub-D-type connector
Method:	EIA RS-232-D
Type:	Asynchronous transmission
Bits per second:	110, 200, 300, 600, 1200, 2400, 4800, 9600, 19200
Parity: Transmit:	Odd, even, mark, space
Receive:	Data check: odd, even
Line control:	READY/BUSY, DC1/DC3
Data word:	7- or 8-bit
16550 UART Support	Yes
Selectable Serial Port (BIOS Setup)	COM1(IRQ4, 3F8h) COM2(IRQ3, 2F8h) COM3(IRQ4, 3E8h) COM4(IRQ4, 2E8h) Disable
Parallel Port	EPP/ECP Bidirectional
Connector Type	25-Pin, DB-25 Connector
Fast I/R Port	Yes
Transfer Data Rate	4 Mb/s
Mobile Productivity Base Ready	Yes

1.6 Regulatory Agency Approvals

All Extensa 900 Series products meet the following regulatory agency standards:

- Underwriter's Lab (UL) Standard 1950 (safety)
- Canadian Standards Association (CSA) Standard 950 or CUL (safety)
- FCC CFR 47, Part 15, Subpart B, FCC Level B (Emissions)
- Canadian Department of Communications (DOC) ICES, Class B (Emissions)
- VDE- EN60950 (Safety)
- EN 50082-1 (Immunity: ESD, RFI, EFT, and Surge)
- EN 50081-1 (Emissions: RFI, EMI, Harmonics, and Flicker)
- Approval Marks: UL, CUL, VDE, FCC, and CE

2 Installation

2.1 Introduction

This section contains unpacking and preparation for use instructions for the Extensa 900 Series Notebook Computers. This includes:

- Removing the computer and all manuals, options and accessories from the shipping container(s)
- Installing Internal Notebook Options
- Installing External Notebook Options
- Installing Battery Packs
- Installing Desktop Devices
- Installing the AC Adapter
- Checking Out the System
- Installing the System Software
- Making Backups of System Software
- Loading Application Software

2.2 Unpacking Instructions

Unpack the computer using the following instructions:

1. Carefully cut the tape that seals the top flap of the shipping carton.
2. Remove the computer and the accessories carton from the main shipping carton.
3. Remove all protective coverings from the computer.
4. Open the accessory box; remove the contents.

Note: Save the two shipping containers and packaging for later reuse.

2.3 Installing Internal Notebook Options

If you have no internal options to install at this time, skip to Paragraph 2.4. Otherwise, continue with Paragraph 2.3.1.

2.3.1 Installing Main Memory Expansion (Optional)

Main memory on the 900 Series Notebooks can be expanded using an EDO Small Outline Dual Inline Memory Module (EDO soDIMM). These modules are available in 8 MB, 16 MB, 32 MB, and 64 MB sizes and install in the expansion memory slot on the System Board accessed through the Memory Expansion Door on the bottom of the notebook. The installation process consists of the following steps:

Caution: The EDO soDIMM module option contains components that are sensitive to static electricity. When handling the module and the internal parts of the computer, protect against static electricity by using wrist or ankle grounding straps and grounded working mats. When moving or storing items, use the anti-static bags supplied with the items.

---

1. Ensure that the notebook is powered off and the AC adapter disconnected from the AC outlet. Also, ensure that all batteries are out of the unit.

2. Disconnect any peripheral device interface cables from the external interface connectors and remove any installed PCMCIA options.

3. Turn the notebook over and locate the Expansion Memory Access Cover on the bottom of the notebook.

4. Remove the screw holding the Expansion Memory Access Cover and remove the cover.

5. Remove the EDO soDIMM module from its shipping container.

6. Refer to Figure 2-1. To install an soDIMM module, first align the connector edge of the memory module with the key in the connector. Insert the edge of the memory module board into the connector using a rocking motion to fully insert the module. Push downward on each side of the memory module until it snaps in place.

7. Reinstall the Expansion Memory Access Cover using the screw removed in Step 4.

8. Replace the batteries and AC adapter.

9. Power up the notebook. If all of the installed memory is not recognized, try reseating the soDIMM module and rebooting.

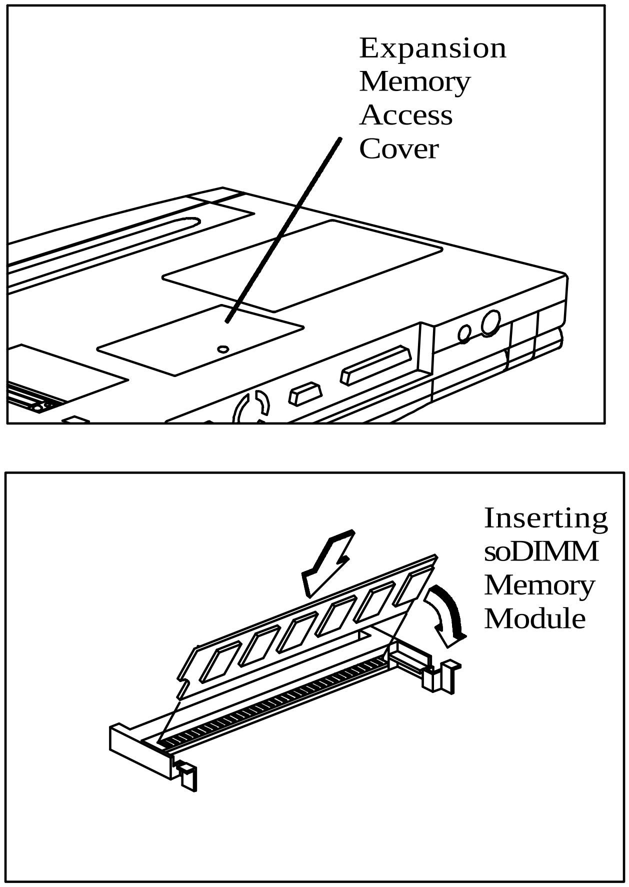


Figure 2-1 Memory Expansion Removal/Replacement

Note: After installing expansion memory in your notebook, you must run the *PHDISK* utility in order for the *Save-To-Disk* or *0V Suspend* functions to operate correctly.

2.3.2 Setting up the Software

Note: If you are using an operating system other than Windows 95, Windows for Workgroups, or DOS, you may need to re-partition your hard disk drive to allow for the additional memory. Check with your system administrator.

In Windows 95

Follow these steps if your computer is running Windows 95.

1. From the Taskbar, select **Start** then **Shut Down**.
2. Select the **Restart the Computer in MS-DOS mode**.
3. Click on **Yes**.
4. Type **PHDISK /C /F** at the DOS prompt and press **Enter**.
5. The DOS screen appears and shows the save file name and size. Press any key to reset the system. The computer will reboot.

In Windows for Workgroups

Follow these steps if your computer is running MS-DOS® and Windows for Workgroups.

1. Close all applications and exit Windows for Workgroups to MS-DOS.
2. At the command prompt (typically C:\) type **PHDISK /C /F** and press **Enter**. This will create a file which can be used to save the contents of your memory system when you perform a *0V Suspend* operation.

2.3.3 Installing PCMCIA Options

The Notebook has two connector slots for PCMCIA option cards. These two slots can be used to install one Type III or two Type I/II credit card size PCMCIA option cards. You can install a PCMCIA (PC card) without turning the computer off.

Use the following procedure to install a PCMCIA option:

1. Review the installation instructions supplied with the PCMCIA option card(s).
2. Hold the card at the end opposite the connector pins with the label side up. Insert the card into an unused slot on the left side of the Notebook.
3. If the option requires external cabling (e.g., modem option), connect external cabling at this time.

Note: After installation of a PCMCIA option card, Windows 95 displays the **New Hardware Found** dialog box to help you configure the new device. To remove a card, click on the **PCMCIA** icon; then, press the appropriate PC Card Release lever (or press both levers for a Type III device) and remove the option.

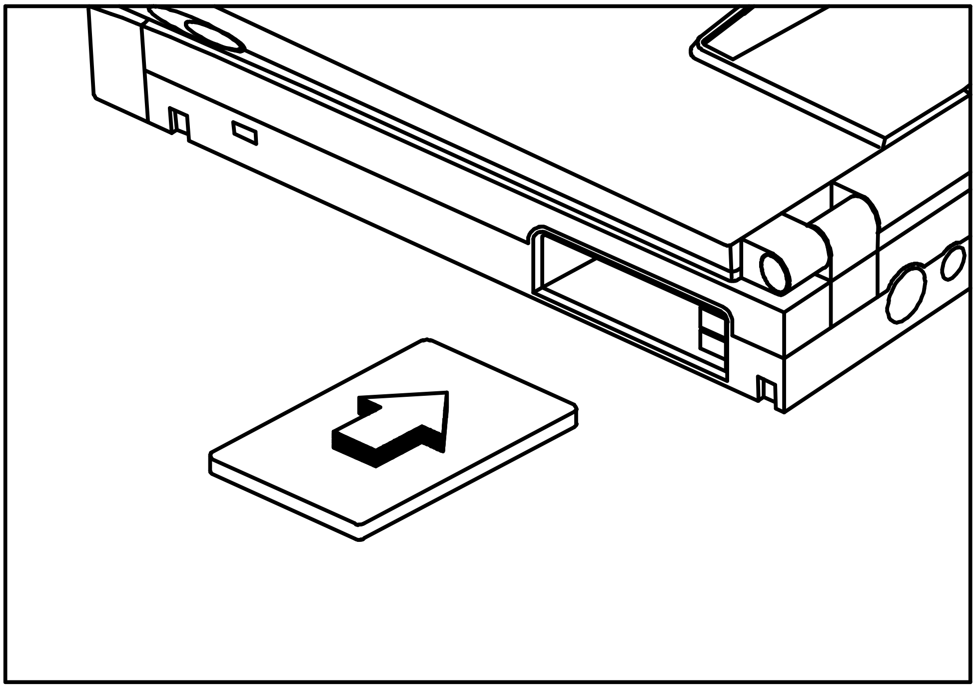


Figure 2-2 Installing PCMCIA Option Cards

Note: When installing a Zoomed Video option card, the card must be installed in the lower card slot (slot 0 or A). Other option cards can be installed in either card slot.

2.4 Installing External Notebook Options

2.4.1 Installing the Mobile Productivity Base (Option)

If using the Mobile Productivity Base option, install this accessory now. If not using the MPB at this time, proceed directly to Paragraph 2.4.2.

2.4.1.1 Docking the Notebook to the MPB

To dock the Notebook Computer into the MPB, use the following procedure:

1. Turn the notebook over and open the expansion door (slide the door toward the center of the notebook) to expose the docking connector.
2. Slide the lever release latch to the front of the MPB to release the docking lever (refer to Figure 2-3).

3. Swing the Docking Lever outward a full 90 degrees from the side of the MPB.

4. Slide the notebook into the MPB, right side first, as shown in Figure 2-3. Ensure that the docking guides on both the notebook and the MPB are securely hooked.

5. Rest the notebook on the MPB. Then press and hold the notebook against the MPB and swing the Docking Latch inward until the Lever Release Latch locks.

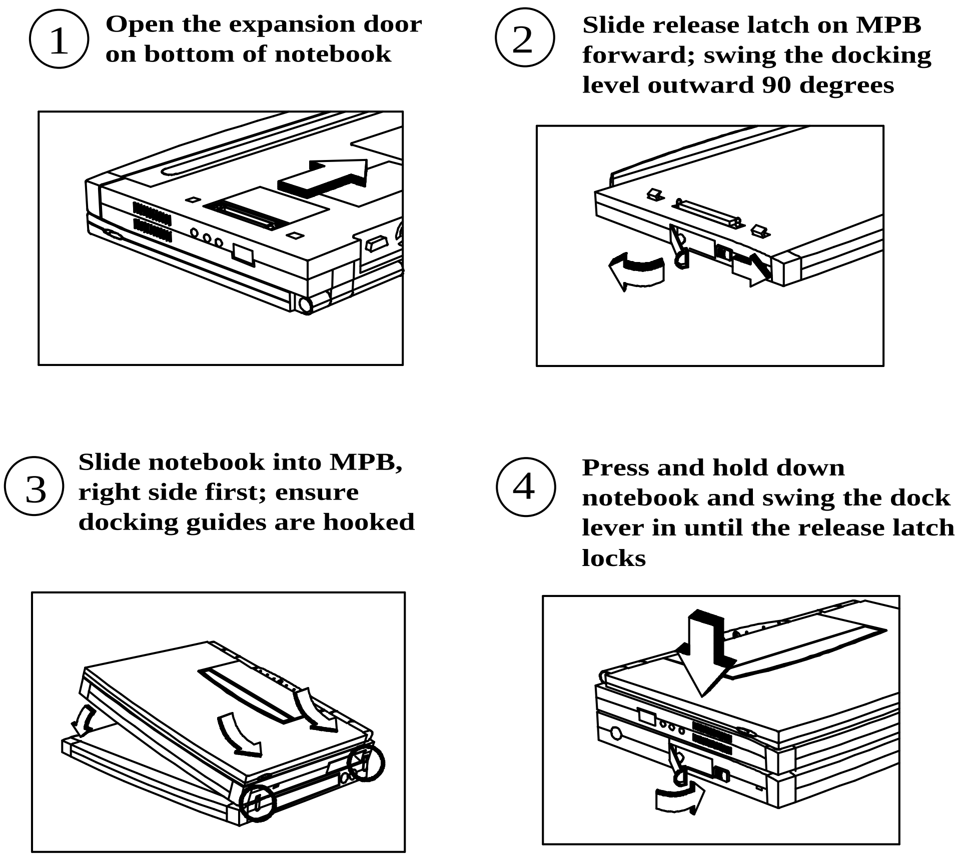


Figure 2-3 Docking the Notebook into the MPB

2.4.1.2 Cabling to the MPB

Refer to Figure 2-4 (MPB Port Assignments) and then connect all desktop devices to the MPB instead of directly to the notebook as described in Paragraphs 2.4.2 through 2.4.5.

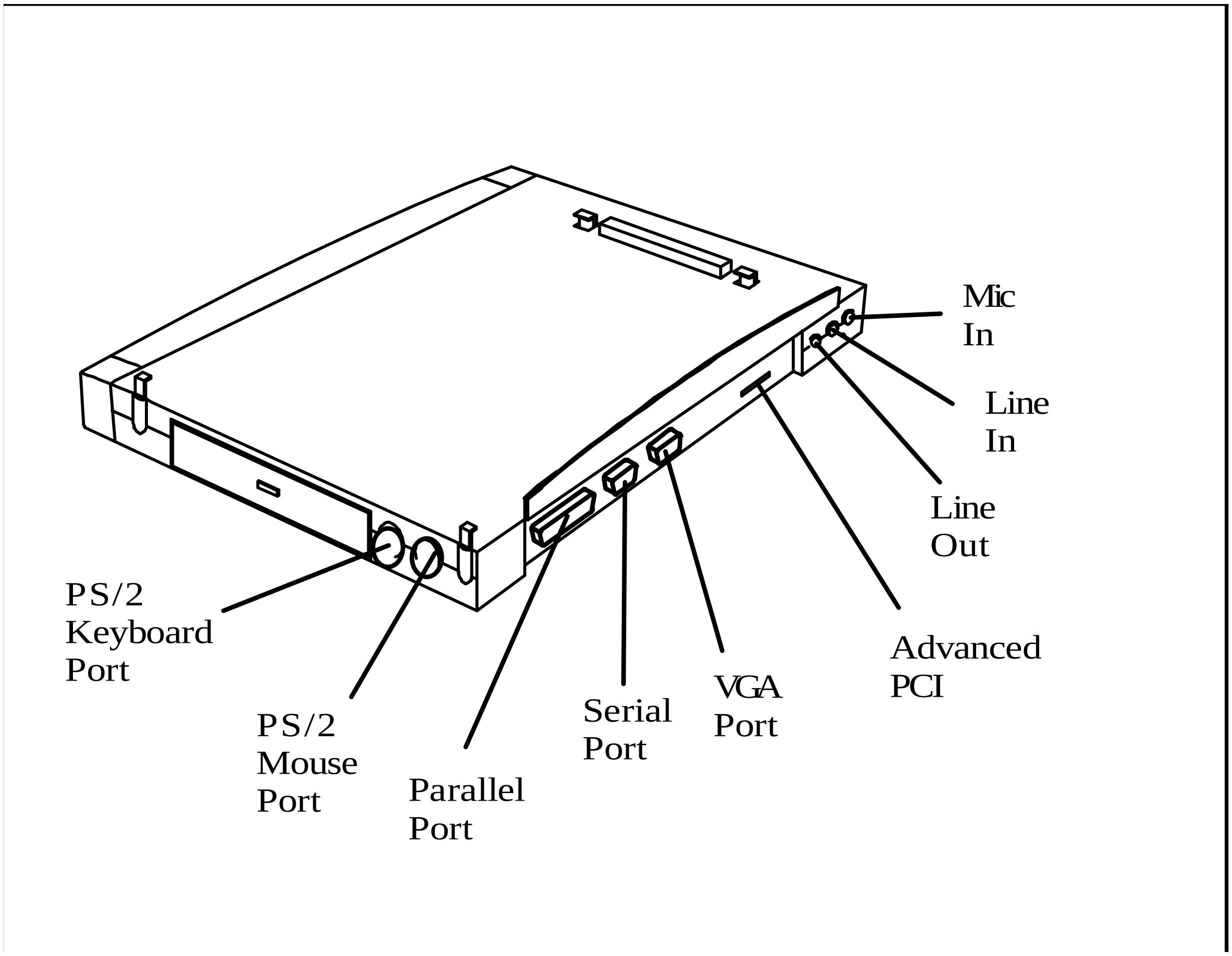
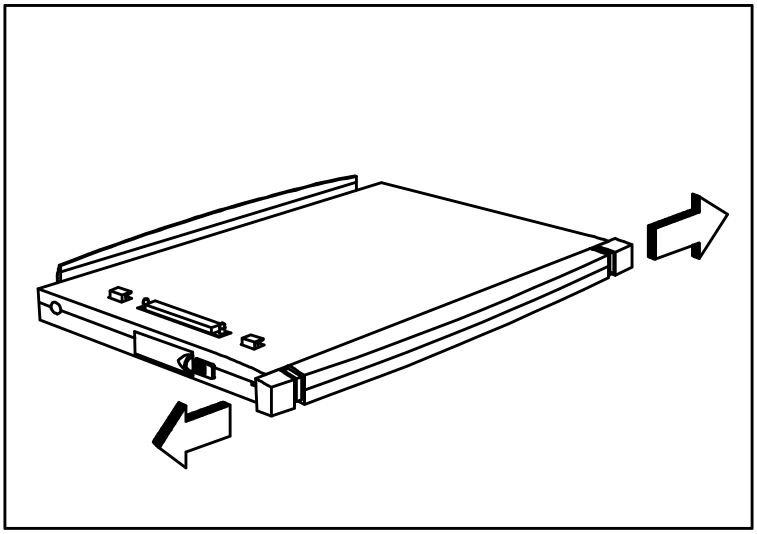


Figure 2-4 MPB Port Assignments



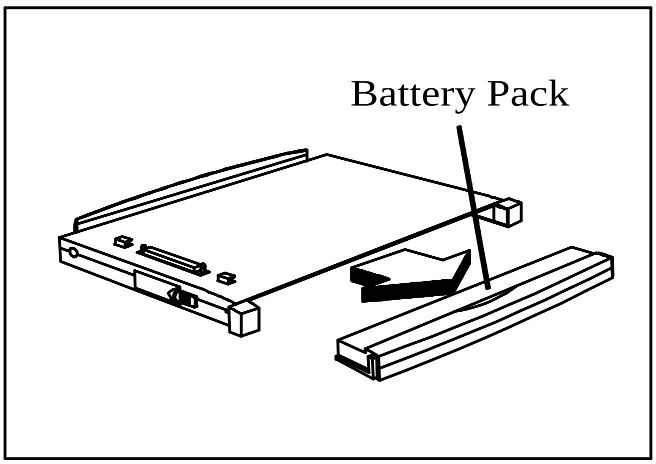
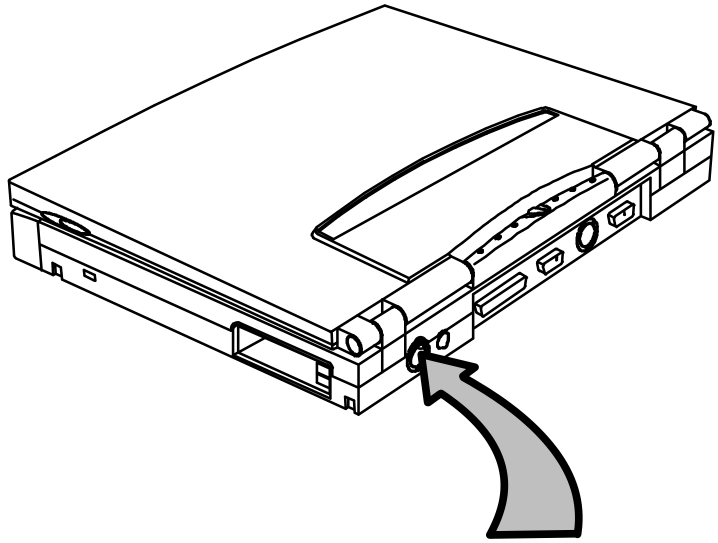


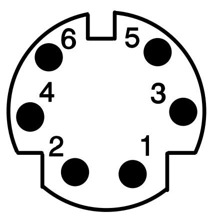
Figure 2-5 MPB Battery Pack Removal/Installation Installation

2.4.2 Installing Ext. Keyboard/Mouse/Numeric Keypad

A PS/2 compatible Keyboard, mouse or an optional PS/2-compatible numeric keypad may be installed on the notebook via the mouse connector on the left rear port as shown in Figure 2-6.

Note: Refer to Figure 2-4 for port assignments if using the MPB option.





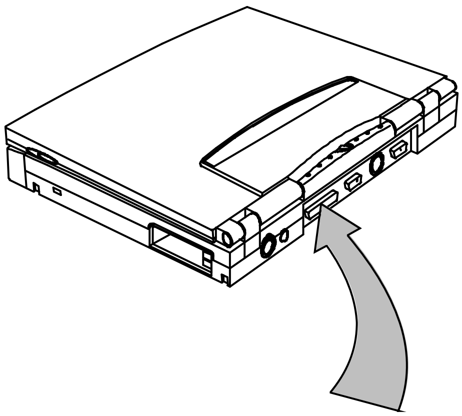
Mouse/Keyboard Connector	
Pin No.	**Signal Name**
1	MDATA/KDATA
2	
3	MSGND
4	MSVcc
5	MCLK/KCLK
6	

Figure 2-6 PS/2 Port Connections

2.4.3 Installing an External Parallel Printer

The Notebook is equipped with an external, bidirectional, ECC/EPP compatible, 25-pin parallel printer port. The connector pinouts and connector location are shown in Figure 2-7.

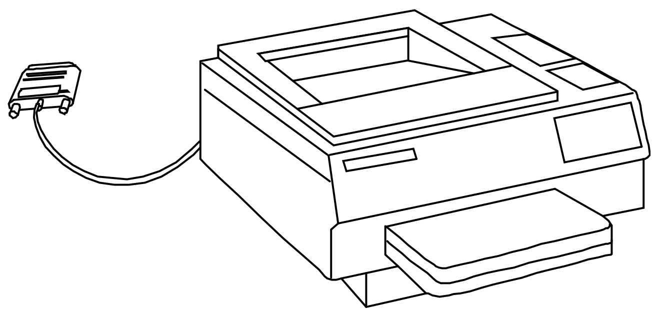
Note: Refer to Figure 2-4 for port assignments if using the MPB option.



PARALLEL PORT PINOUTS

	SIGNAL	SPP Mode
1	Strobe*	STB*
2	Data Bit 0	PD0
3	Data Bit 1	PD1
4	Data Bit 2	PD2
5	Data Bit 3	PD3
6	Data Bit 4	PD4
7	Data Bit 5	PD5
8	Data Bit 6	PD6
9	Data Bit 7	PD7
10	Acknowledge*	ACK*
11	Busy	BUSY
12	Paper Out	PE
13	Select	SLCT
14	Auto Line Feed*	AFD*
15	Error*	ERR*
16	Initialize Printer*	INIT*
17	Select In*	SLIN*
18	LPT 18	LPT18
19	VCC	VCC
20	PLP120	PLP120
21	PLP121	PLP121
22	PLP122	PLP122
23	FDD 5V	FDD 5V
24	FDD 5V	FDD 5V
25	LP125	LP125
26	Ground	Ground

Note: * Denotes Active Low



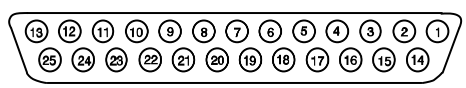


Figure 2-7 Parallel Port Pinouts

2.4.4 Installing an External Serial Port Device

The notebook contains an external RS-232 serial port with a 9-pin, male DB-9 connector as shown in Figure 2-10 (25-pin cables require the use of an adapter for use with the 9-pin port). The serial ports are used to interconnect such devices as:

- ♦ External Modem
- ♦ Serial Mouse
- ♦ Serial Printer

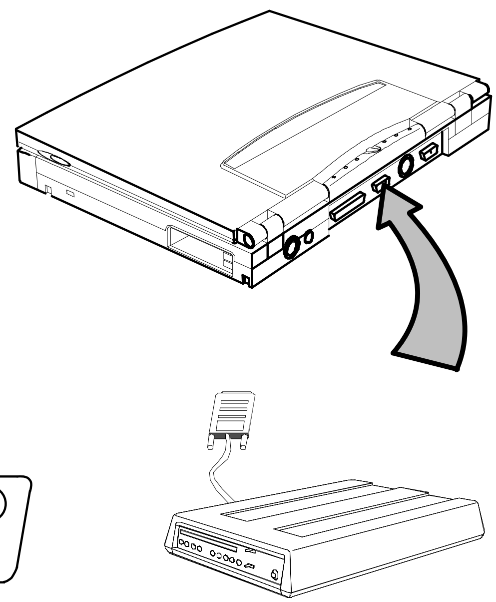
♦ Any device that uses an RS-232 interface

Note: Refer to Figure 2-4 for port assignments if using the MPB option.

Caution: Never connect a parallel device to a serial port or a serial device to a parallel port or video port; this may cause damage to the notebook and/or external device. If you are uncertain of what type connector the external device has, refer to the technical manual for the external device.

SERIAL PORT PINOUTS

PIN	SIGNAL
1	DCD (CARRIER DETECT)
2	RXD (RECEIVE DATA)
3	TXD TRANSMIT DATA)
4	DTR (DATA TERMINAL READY)
5	GND (GROUND)
6	DSR (DATA SET READY)
7	RTS (REQUEST TO SEND)
8	CTS (CLEAR TO SEND)
9	RI (RING INDICATOR)



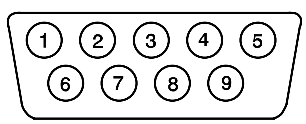
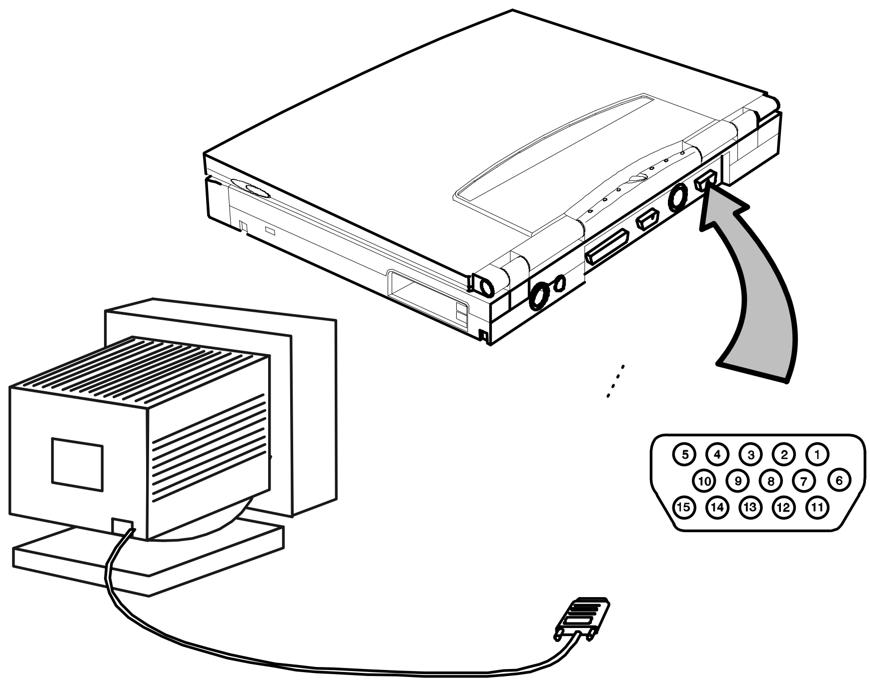


Figure 2-8 Serial Port Pinouts

2.4.5 Installing an External VGA Monitor

The notebook (and optional MPB) contain an external CRT port that can drive one of a variety of monitor resolutions and colors as summarized in Section 1. The associated connector location and pinouts for the notebook are shown in Figure 2-9.

Note: Refer to Figure 2-4 for port assignments if using the MPB option.



EXTERNAL VGA CONNECTOR PINOUTS

PIN	SIGNAL NAME	DIRECTION
1	RED VIDEO	OUTPUT
2	GREEN VIDEO	OUTPUT
3	BLUE VIDEO	OUTPUT
4	NOT USED	
5	GROUND	
6	RED RETURN	INPUT
7	GREEN RETURN	INPUT
8	BLUE RETURN	INPUT
9	NOT USED	
10	GROUND	
11, 12	NOT USED	
13	HORIZONTAL SYNC	OUTPUT
14	VERTICAL SYNC	OUTPUT
15	NOT USED	

Figure 2-9 External VGA Pinouts

Use the following procedure to install an external monitor:

1. Turn off power to both the notebook and monitor.

2. Connect the 15-pin external VGA cable from the monitor to the VGA connector on the notebook computer (Figure 2-9) or MPB (Figure 2-4).

3. Power up the notebook computer first; then, turn on power to the monitor.

4. Setup the notebook display mode for **LCD only**, **simultaneous LCD and CRT** or **CRT only** (under Windows 95, select the **Change Display Utility**; under

Windows for Workgroups, use the **WinMode Utility**).

5. Install the correct driver, if required (refer to the Monitor Installation Instructions supplied by the CRT vendor).

2.5 Primary Battery Pack Installation

1. Turn off the computer and disconnect the AC adapter if attached to the computer.
2. Unlatch the end locks by pushing the endcaps outward with your thumbs.
3. Align battery connector to connector on notebook and insert the battery pack into the battery compartment; then push the battery in completely until you feel the contacts engage.
4. Relatch the battery locks on both ends of the battery.

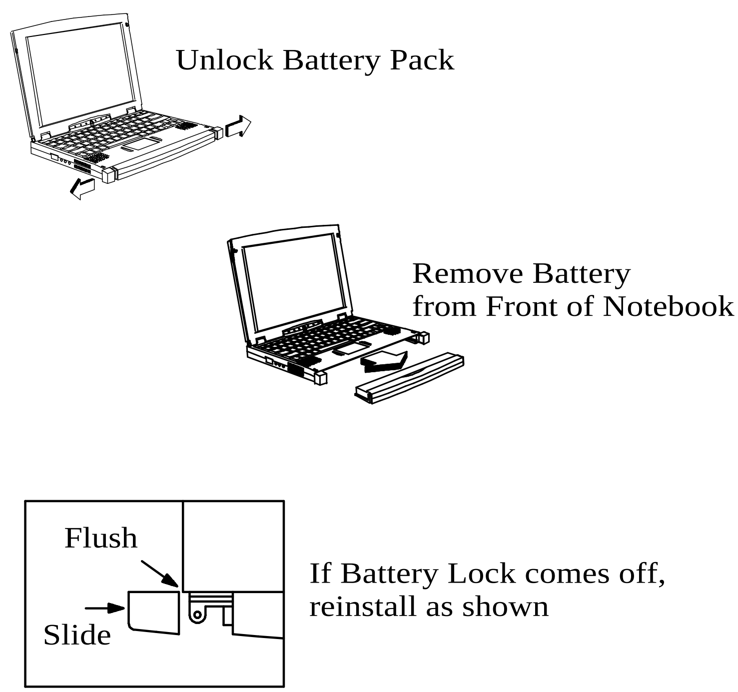


Figure 2-10 Notebook Battery Removal/Replacement

2.6 Installing the AC Power Adapter

Use the following procedures to connect the AC adapter to the system:

Caution: Use only the AC adapter supplied with the computer; other adapters can damage the unit.

1. Remove the AC adapter from the packaging. Connect the round coaxial connector supplied with the notebook to the **DC IN** power receptacle on the left rear of the notebook as shown in Figure 2-9.
2. Connect the female side of the AC power cord to the AC adapter and connect the male end to a grounded AC outlet.

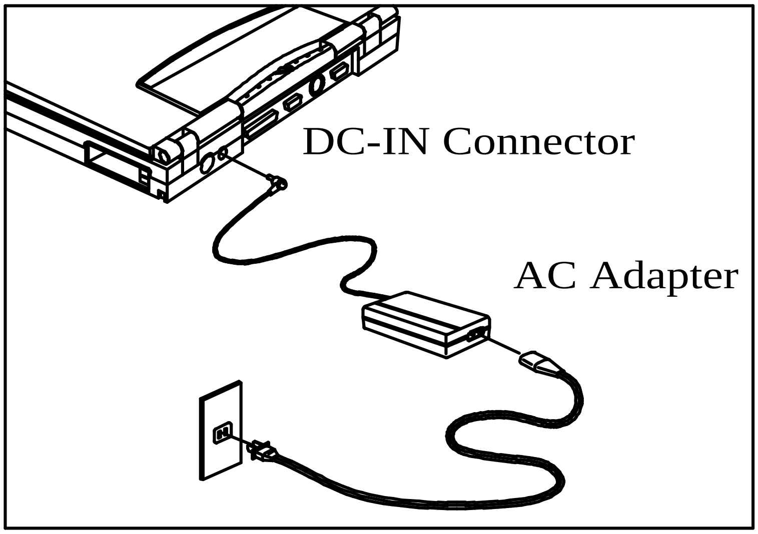


Figure 2-11 Installing the AC Adapter

2.7 Initial Software Load

After unpacking and setting up the notebook for the first time, you must perform an initial software load that takes approximately 30 minutes.

Because of the way Windows 95 structures its files, stopping in the middle of the setup process can cause irreversible file damage.

Before starting the initial software load process, ensure that you have the following:

- **Extensa 900 User's Guide** - Contains latest software installation instructions.
- **AC Adapter/Access to AC power** - Although the battery pack may have some charge, it may be insufficient for the entire set up. Loss of power during setup can cause irreversible file damage.
- **Certificate of Authenticity** - You will need to enter the number from your *Windows 95 Certificate of Authenticity* during Windows 95 Setup. This certificate is part of the Windows 95 documentation kit. You need this number even if you are installing Windows for Workgroups.
- **Language** - During initial setup you choose the following:
  - Language for Windows displays
  - Language for keyboard installed
- **Printer type** - As part of the Windows setup, you are prompted to choose a printer. Microsoft® includes the files for many different printers. If you cannot find your printer in the list, you will need the floppy disk with the printer driver provided by the printer manufacturer. If you do not want to install a printer at this time, you can skip this part of the setup. Which operating system to load
- **Operating System Type** - During initial setup you must choose which operating system to load, either Windows 95 or MS-DOS and Windows for Workgroups (DOS+WFW). *This choice is final. You will not be able to change the operating system after installation is complete.* For most users Windows 95 is the better choice. You might want to load DOS+WFW under the following circumstances.
  - Your corporation or workgroup may have guidelines that require use of DOS+WFW. Check with your manager to determine the policy at your company.
  - The software that controls your local area network may not be compatible with Windows 95. Check with your network administrator to determine whether Windows 95 is compatible.
  - Although most software that is compatible with DOS+WFW is also compatible with Windows 95, it is possible that the existing software you are using will not run in Windows 95. If you have a critical software application that you intend to copy to your new computer, check with the manufacturer of the software to determine whether your application is compatible with Windows 95.

3
Operating Instructions

3.1 Introduction

This section contains a summary of notebook operating procedures useful for maintenance operations. For additional detail, refer to the *Extensa 900 Series Notebook Computer User's Guide* supplied with the notebook.

3.2 Controls/Indicators

The operating controls and indicators for the 900 Series Notebooks are shown in Figure 3-1 and briefly described in the following paragraphs.

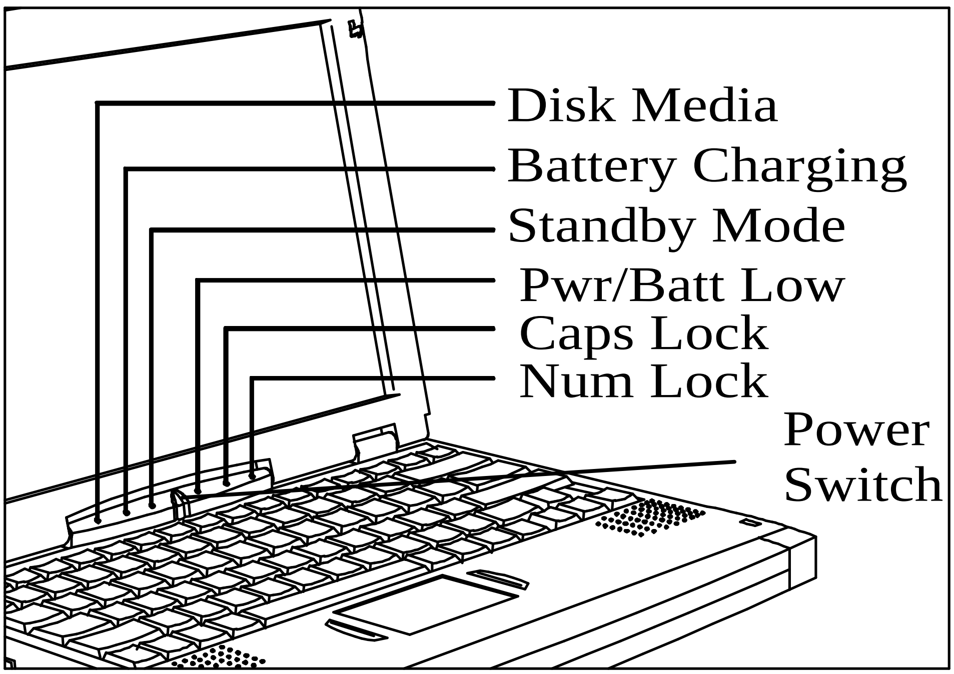


Figure 3-1 Operating Controls and Indicators

3.2.1 Power On/Off Switch

The notebook contains an alternate action power switch located center of the notebook near the status indicators as shown in Figure 3-1. The first time you press the power switch, power is turned on to the notebook. The next time you press the power switch, power is turned off.

3.2.2 Notebook LEDs

The notebook contains the following LED Indicators:

- ♦ Disk Media Indicator
- ♦ Battery Charging Indicator
- ♦ Standby Mode Indicator
- ♦ Power On/ Battery Low (Blinking) Indicator
- ♦ Caps Lock Indicator
- ♦ Num Lock Indicator

3.2.3 LED Icons

Table 3-1 contains a listing and description of Extensa LED Icons:

Table 3-1 LED Icon Descriptions

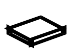
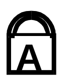
Icon	Description
	**Disk Media Indicator** Lights when the computer writes to or reads from the floppy disk drive, or reads from the CD-ROM drive.
	**Battery Charging Indicator** Lights when a powered AC adapter connected to the computer is charging the battery. Flashes when there is a problem with the battery or the battery is not recognized by the smart charger. Turns off when there is no battery or the battery is fully charged.

Table 3-1 LED Icon Descriptions

Icon	Description
	**Standby Mode Indicator** Lights when the computer is in Standby mode. Flashes when the computer is in the 5V Suspend mode. The computer enters Standby Mode if the Standby hot key (**Fn+F4**) is pressed or the **Standby Timeout** parameter in Setup is enabled and expires. The computer enters 5V Suspend Mode if the Suspend hot key (**Fn+F3**) is pressed or the **5V Suspend Timeout** parameter in Setup is enabled and expires or the display is closed.
	**Power/Battery-low Indicator** Lights when the computer is on and there is power to the computer. Flashes when the battery power is low. Connect a powered AC adapter to the computer as soon as possible.
	**Caps Lock Indicator** Lights when the caps lock function is toggled ON using the Caps Lock Key.
	**Num Lock Indicator** Lights when the embedded numeric keypad is toggled ON using the Num Lock hot key (**Fn+F7**). Refer to *Using the Internal Numeric Keypad* section in the *Extensa 900 Series User's Guide* for further details.

3.2.4 Keyboard Hot Key Sequences

Table 3-2 contains a summary of keyboard hot key sequences useful when performing maintenance operations.

Table 3-2 Summary of Notebook Hot Key Sequences

Function	Key Sequence
CMOS Setup	**Fn+F1**
Enter 0V Suspend Mode	**Fn+F2**
5 Volt Suspend	**Fn+F3**
Enter Standby Mode	**Fn+F4**
Resume from Standby Mode	Press any key
Scroll Lock	**Fn+F6**
Numeric Lock	**Fn+F7**
Turn off the LCD backlight	**Fn+F11**
Turn on the LCD backlight	Press any key

Table 3-2 Summary of Notebook Hot Key Sequences

Function	Key Sequence
Alternate between display modes (LCD, Ext.l CRT or both)	**Fn+F12**
Decrease LCD screen brightness	**Fn+Down Arrow**
Increase LCD screen brightness	**Fn+Up Arrow**
Lighten LCD screen contrast	**Fn+Right Arrow**
Darken the LCD screen contrast	**Fn+Left Arrow**
Exit 0V Suspend Mode	Press Power switch
Toggle speaker output on/off	**Fn+End**
Stop a command or application	**Ctrl+Pause**
Resume a command or application	Press any key
Send the contents of the screen to the printer	**Shift+PrtSc**
Sets the notebook to echo keystrokes to the printer; prints a line when you press **Enter**; continues until you press **Ctrl+P**	**Ctrl+P**
Enable/disable the internal keypad	**Fn+T**
Warm boot	**Ctrl+Alt+Del**
Start	Windows logo key
Display the application's context menu	Application key

Table 3-3 Hot Keys Available on Attached External keyboard

Function	Key Sequence
System Setup	**Ctrl+Alt+F1**
0V Suspend	**Ctrl+Alt+F2**
5V Suspend	**Ctrl+Alt+F3**
LCD/CRT Toggle	**Ctrl+Alt+F12**
Speaker Toggle	**Ctrl+Alt+S**

3.2.4.1 Windows 95 Special Keys

Pressing the Windows Logo Key acts as the Start button. Pressing this key in combination with other keys performs special functions. Table 3-4 contains several examples of using the Windows 95 special keys.

Table 3-4 Windows 95 Special Keys

Hot Key	Function
Windows Logo Key+**Tab**	Activates next Taskbar button
Windows Logo Key+**E**	Explore my Computer
Windows Logo Key+**F**	Find Document
Windows Logo Key+**M**	Minimize All
Windows Logo Key+**R**	Display Run dialog box

Pressing the Application Key displays the context menu for an application. This is the same as clicking the secondary (right) mouse button.

Please refer to your Windows 95 manual for more information on these Windows 95-specific keys and their functions.

3.2.4.2 DOS Special Keys

Table 3-5 contains a list of the DOS special keys.

Table 3-5 DOS Special Keys

Hot Key	Function
Ctrl+Pause	Stops a command or application; primarily used to stop the screen from scrolling; pressing any other key resumes the execution of the command or application.
Shift+Prt Sc	Sends the contents of the screen to the printer port; prints only text characters unless you have run the **Graphics.com** utility to enable printing graphics.
Ctrl+Break	Terminates the current command or application.
Ctrl+P	Sets the computer to echo keystrokes to the printer; prints a line when you press **Enter**; continues until you press **Ctrl-P** again.
Ctrl+Alt+Del	Terminates all programs, reloads MS-DOS and executes the **Autoexec** file; also called the “warm start” or “warm boot”.

3.3 Configuring the Touchpad

You can personalize the control of the touchpad by configuring various settings using the Synaptics® Touchpad utility. Configure the touchpad using the Mouse utility located in the Control Panel Window. Follow these steps to configure the Touchpad:

In Windows 95

1. Select the **Start** button, then select **Settings**.
2. Select **Control Panel** to display the Control Panel window.
3. Double-click on the **Synaptics Touchpad** icon.
4. Select the touchpad tab to customize the touchpad to your preference.
5. Click on **Enhancements** to bring up additional features and to get to the online help for the Synaptics Touchpad drivers.

In Windows for Workgroups

1. From the **Program Manager** double-click on the **Main** program group.
2. Double-click on the **Control Panel** icon.
3. Double-click on the **Synaptics Touchpad** icon.
4. Select the touchpad tab to customize the touchpad to your preference.
5. Click on **Help** for the Synaptics Touchpad drivers online documentation.

3.4 Using a CD-ROM Drive (MPB Option Only)

An optional CD-ROM drive installed in the modular bay of a docked Mobile Productivity Base option provides fast access to text, programs, graphics, sound, animation and video on a standard CD. (With an optional MPEG PC Card installed, you can play back approximately 75 minutes of MPEG1-compressed, full-motion video from a CD.)

3.4.1 Inserting a CD (MPB Option Only)

1. With the system powered up, press the eject button on the front of the CD-ROM drive to eject the disc tray.
2. Slide out the disc tray.
3. Place the CD, label side up, in the depression on the disc tray.
4. Slide the disc tray into the drive.

3.4.2 Handling CDs (MPB Option Only)

Follow these guidelines to avoid damaging your CDs:

- ♦ When removing a CD from its protective case or loading a CD into a drive, hold the CD by its central hole and outer edge. Never touch the data surface (non-label side).

- To protect the CD against scratches and dirt when not in use, keep the CD in its protective case.
- Clean a CD with a clean, dry, lint-free cloth. Always wipe from the center to the edge. Don't wipe the CD in a clockwise or counterclockwise direction.
- Keep CDs away from high temperatures and direct sunlight.

3.5 Built-In Sound System

The Extensa 900 Series Notebook comes with an internal microphone and stereo speakers. These features give direct sound generation and recording capability in the system.

3.5.1 Turning Sound On/Off

To mute or restore sound, press the following keys:

- **Fn+PgUp**: Turns mute On/Off

3.5.2 Sound Software

The computer has pre-installed sound support utilities in the **AudioRack32** group. These include:

- AudioRack™32
- Audio Recorder

3.5.3 External Sound Equipment

You can improve the quality of sound production and increase convenience by connecting external sound equipment.

The computer has the following jacks for connecting to external sound equipment:

- ♦ Microphone Input
- ♦ Stereo Headphone/Speaker Line Output
- ♦ Stereo Line Input

3.6 Using Remote Connections

The computer can send and receive e-mail, surf the Internet, connect to one of the online services or share files with other office employees.

The Extensa communicates with the outside world in one of the following ways:

- ♦ Over a telephone line using a PC Card modem installed in the computer
- ♦ Over a network using a network adapter

Note: You can purchase compatible modems and network adapters from your dealer or directly from Texas Instruments.

3.6.1 Using the Fast Infrared (FIR) Port

The FIR port, located on the rear of the computer, offers wireless communication with other Texas Instruments notebook computers or a variety of IRDA™-compliant devices. Without a physical connection, you can print remotely, transfer files between computers, use a remote mouse during a presentation or receive information from a PDA or pocket organizer. To transfer a file follow these steps:

Align the FIR ports of the two devices making sure that the distance separating them is between six inches and three feet (one meter).

After the devices are aligned, use the TranXit™ software, located in the TranXit group, to complete the communication process. (For further information, refer to the online *TranXit Quick Reference Guide*.)

3.7 Using Zoomed Video Features

Your computer supports Zoomed Video (ZV) PC Cards through the PC Card slots. ZV PC Cards connect to the internal ZV port, allowing advanced multimedia capabilities such as video conferencing and on-screen television at full, smooth motion. The Zoomed Video port adds a dedicated video bus that provides a direct link between a PC Card and the VGA accelerator or audio DAC. This “detour” lets video and audio data bypass the PCI bus, reducing bandwidth impositions and improving system performance for more fluid audio and video.

3.7.1 MPEG PC Card

The optional MPEG PC Card uses the Zoomed Video port built into the computer to display MPEG video and audio on the computer. The MPEG card features MPEG-1 video playback with 16.7 million colors, MPEG-1 audio layers I and II, is MPC3 compliant and Windows 95 Plug and Play. With this option you can run full-motion video, combined with digital audio, graphics, text and data, enabling you to create far more effective presentations or play the most advanced video games.

3.8 Battery Saving Tips

There are a number of actions you can take to reduce the rate at which your computer depletes the battery. By taking some or all of these actions, you can substantially increase the time you can operate on battery power before recharging the battery:

- Reducing screen brightness — Although the screen controller uses new technology to increase brightness without increasing energy consumption, the screen is still the largest single consumer of the battery charge. Reducing the brightness to the lowest acceptable level increases battery life. To reduce the brightness, press **Fn**+↓.
- Caching the hard disk drive -— By caching the hard disk drive, you can reduce the length of time the hard disk drive is rotating and using energy. Both Windows 95 and Windows for Workgroups use a disk-caching program by default. As long as you have not disabled these programs, you can take advantage of the battery savings.

3.8.1 Lowering Inactivity Timeouts

Inactivity timeouts turn off devices in the computer when you are not using them. Lowering the inactivity timeouts shortens the period of time the computer waits before turning off the device.

3.8.2 Suspending Operation While Idle

Although the computer goes into Suspend mode automatically after a defined period of inactivity, you can reduce energy consumption even further by pressing either **Fn+F3** (**Suspend**) or **Fn+F4** (**Standby**) as soon as you no longer need the computer to be active.

- ♦ Pressing **Fn+F4** (**Standby**) turns off the screen.
- ♦ Pressing **Fn+F3** (**Suspend**) turns off the screen, stops the hard disk drive, and reduces energy usage to the lowest level possible without turning off the computer.
- ♦ Pressing the **Shift** key resumes activity after the notebook has been in either the Suspend or Standby modes.

3.8.3 Responding to a Low Battery Condition

When you are operating the computer on battery power and the charge remaining is down to between 10% and 20%, the battery-low indicator blinks and an audible alarm sounds. When this happens you should take the following actions to conserve battery power and reduce the possibility of data loss.

- ♦ Saving files — Save all open files frequently while the computer is in a low-battery condition.
- ♦ Turning off the alarm — Turn off the audible alarm by pressing **Fn+End** (**Mute**).
- ♦ Reducing screen brightness — Reduce screen brightness by pressing **Fn**+↓.
- ♦ Connecting the AC adapter — If you have access to AC power, connect the computer to the AC adapter. You can do this without turning off the computer.
- ♦ Suspending operations — Press **Fn+F3** or **Fn+F4** to put the computer into Suspend or Standby mode whenever you are not actively using the computer. Press the **Shift** key to bring the computer out of Suspend or Standby mode.

3.8.4 Replacing the battery

If you have a spare, charged battery, you can do one of the following.

- Insert a secondary battery into the MPB option (if installed).
- If you already have a battery in a docked MPB, you can replace the primary battery without turning off the computer.
- If you cannot insert the spare battery, suspend operations to disk by pressing **Fn+F2** and replace the battery. When you turn on the computer, the computer returns to the saved state.

3.8.5 Saving to Disk

When the battery power becomes critically low (less than 5% charge remaining), the computer saves the current state of the computer to disk and turns off. When you turn the computer on again, the computer restores the state that was saved to disk.

4
Theory of Operation

4.1 Introduction

This section contains a general block diagram theory of operation description of the Extensa 900 Series Notebook Computers.

Note: Various internal components may change on future models and busses/bus speeds are subject to change.

4.2 Notebook Functional Overview

The Extensa 900 Series Notebooks consist of eight major functions or sections including:

- System Processor — implemented on the Main Board Assembly
- Memory Subsystem — implemented on the Main Board Assembly
- I/O Subsystem — implemented on the Main Board Board
- Keyboard Subsystem — implemented on the Main Board Assembly and the Keyboard Assembly
- Video Subsystem — implemented on the Main Board and LCD Display Panel assemblies
- Sound Subsystem — implemented on the Main Board Assembly
- Touchpad Mouse Subsystem — implemented on the Touchpad assembly and on the Main Board Assembly
- Hard Disk Drive Subsystem — implemented on the Main Board Assembly and the Hard Disk Drive Assembly
- Floppy Disk Drive Subsystem — implemented on the Main Board Board and Floppy Disk Drive Assembly
- PCMCIA Controller and Sockets — implemented on the PCMCIA Module and on the Main Board
- Power Subsystem — implemented on the Main Board, the battery pack, and the AC adapter

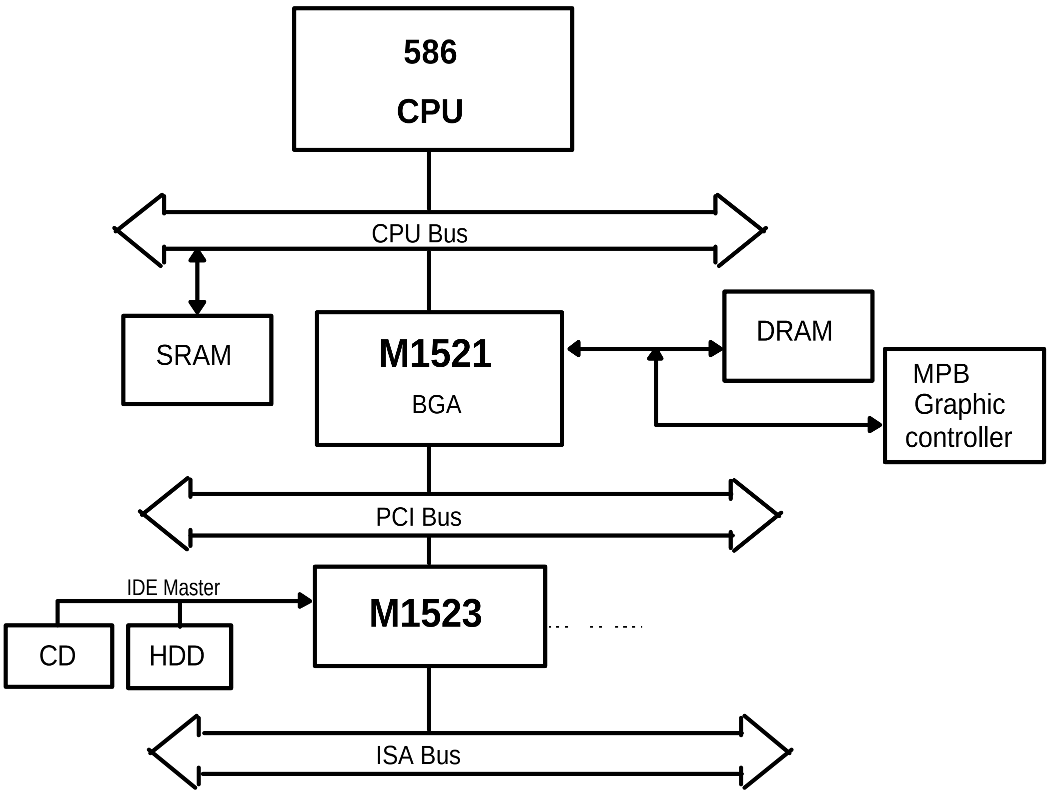


Figure 4-1 Extensa Functional Block Diagram

4.2.1 System Processor

The System Processor function for the notebook is implemented on the Main Board in the form of an Intel Pentium P54-C Superscalar 586 Processor Chip. The processor operates in conjunction with RAM and ROM Memory and other control logic to process software instructions (BIOS, DOS, Windows, and applications). The processor communicates with the hard disk drive and the memory components using high speed busses.

The Processor also interacts with other hardware logic to provide the power savings features for the notebook. These features include controlling CPU clock speeds, reducing clock speeds whenever possible, e.g., when performing floppy disk drive accesses, powering down unused devices, etc. A detailed block diagram of the Extensa 900 Series Notebook is shown in Figure 4-2.

The IRQ assignments for the 900 Series Notebooks is provided in Table 4-1.

Table 4-1 Interrupt Channel map

Priority	Interrupt Number	Interrupt Source
1	SMI	Power management unit
2	NMI	Parity error detected, I/O channel error
3	IRQ 0	Interval timer, counter 0 output
4	IRQ 1	Keyboard
	IRQ 2	Interrupt from controller 2 (cascade)
5	IRQ 8	Real-time clock
6	IRQ 9	Cascaded to INT 0AH (IRQ 2)
7	IRQ 10	Audio (option) / PCMCIA
8	IRQ 11	Audio (option) / PCMCIA
9	IRQ 12	PS/2 mouse
10	IRQ 13	INT from coprocessor
11	IRQ 14	Hard disk controller
12	IRQ 15	CD-ROM controller
13	IRQ 3	Serial port 2, 4
14	IRQ 4	Serial port 1, 3
15	IRQ 5	Parallel port 1 / audio (option)
16	IRQ 6	Diskette controller
17	IRQ 7	Parallel port 2 / audio (option)

NOTE: *A PCMCIA card can use IRQ 3, 4, 5, 7, 9 and 11 as long as it does not conflict with the interrupt address of any other device.*

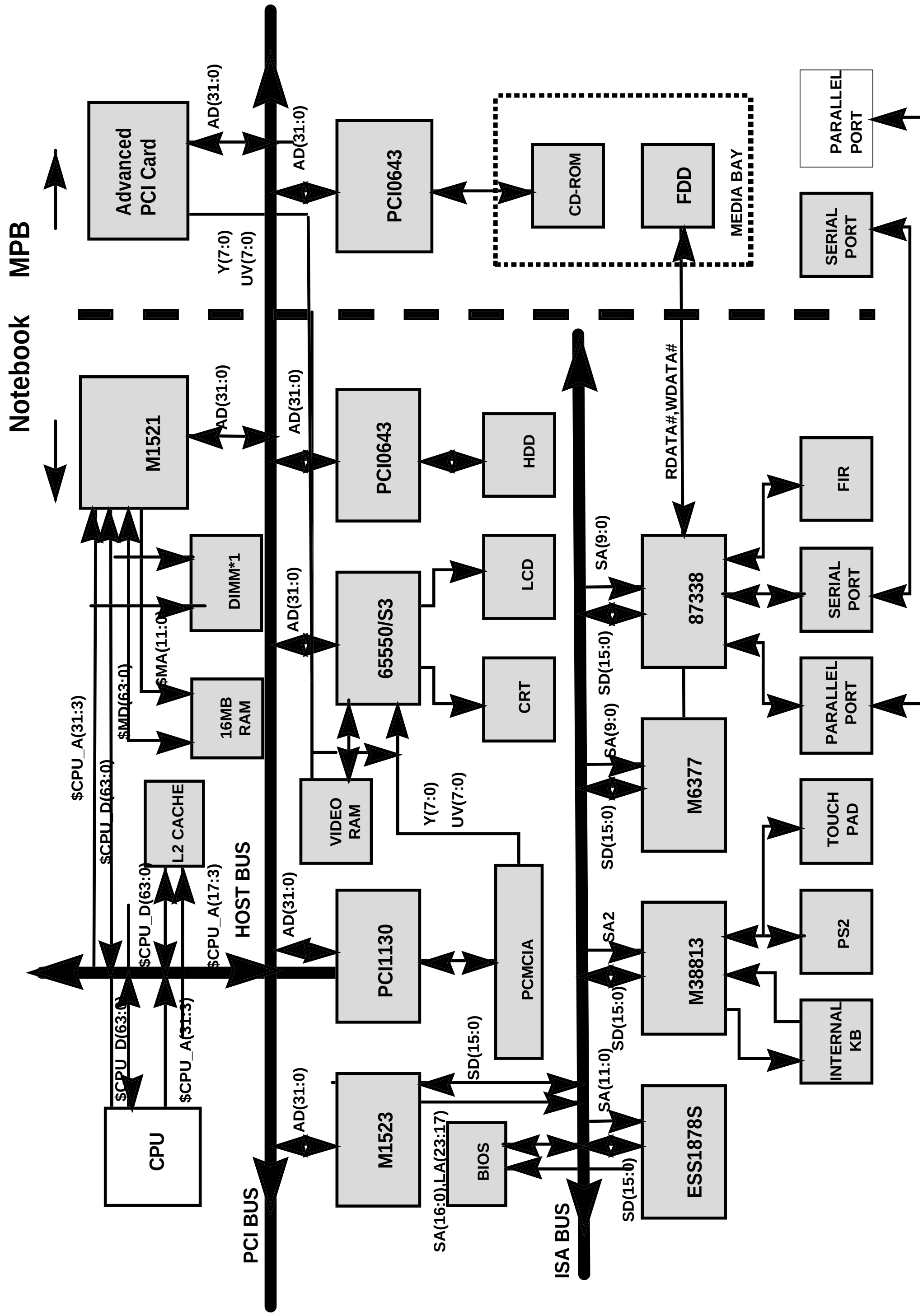


Figure 4-2 Detailed System Block Diagram

4.2.2 Memory Subsystem

The memory subsystem comprises the following components:

- ♦ Main memory
- ♦ L2 Secondary Memory (cache)
- ♦ Flash ROM

The Extensa Series uses fast Extended Data Out (EDO) DRAM for main and video memory and high-speed synchronous, pipelined burst SRAM for L2 cache memory. Main BIOS and Video BIOS are stored in Flash ROM.

The Extensa 900 Series Memory Address Map is shown in Table 4-2.

Table 4-2 Memory Address Map

Address Range	Definition	Function
000000 - 09FFFF	640 KB memory	Base memory
0A0000 - 0BFFFF	128 KB video RAM	Reserved for graphics display buffer
0C0000 - 0CBFFF	Video BIOS	Video BIOS
0E0000 - 0EFFFF **0F0000 - 0FFFFF**	128 KB system BIOS	System BIOS System BIOS
100000 - FFFFFF	Extended memory	Onboard memory
FE0000 - FFFFFF	256 KB system ROM	Duplicate of code assignment at 0E0000-0FFFFF

The DMA Channel Map is listed in Table 4-3.

Table 4-3 DMA Channel Map

Controller	Channel	Address	Function
1	0	0087	Audio (option)
1	1	0083	ECP/FIR/Audio
1	2	0081	Diskette
1	3	0082	ECP/FIR/Audio
2	4	Cascade	Cascade
2	5	008B	Spare
2	6	0089	Spare
2	7	008A	Spare

4.2.2.1 Main Memory

The standard 900 Series notebook comes with 16 MB of Main memory installed on the Main Board. Memory expansion accommodations are provided via a standard soDIMM connector on the bottom of the Main Board Assembly. By installing a 64 MB soDIMM module, the basic memory size can be expanded to a maximum of 80 MB.

4.2.2.2 Flash ROM

All versions of the Extensa notebook family use a "Flash" ROM that contains both the main system BIOS and the VGA BIOS. The Flash ROM contains "Boot Block" logic that allows downloading new versions of BIOS without destroying the Boot Load area.

The Flash ROM execution is 8 bits wide. However, better performance can be attained by enabling the Shadow ROM in the CMOS setup routine or by selecting the Windows Control Panel Applet. When the Shadow ROM is enabled, BIOS is copied into a 32-bit, high-speed system.

4.2.3 System Controller Function

The Extensa 900 Series notebook design uses two chips, the ALI M1521 (memory, Cache and DRAM Controller for the Pentium System and the M1523 (PCI to ISA Bridge chip) combine to provide the 586 system controller function for the new multimedia/ multithreading operating system, Windows 95.

The notebook utilizes the BGA package to improve the AC characterization, resolves system bottleneck and make the system manufacturing easier. The system architecture includes the UMA, ECC, PBSRAM, SDRAM/BEDO, and multi-bus with highly efficient, deep FIFO between the buses, such as the HOST/PCI/ISA dedicated IDE bus.

The I/O Address Map for the 900 Series Notebook is provided in Table 4-4.

Table 4-4 I/O Address Map

Address Range	Device
000 - 00F	DMA controller-1
020 - 021	Interrupt controller-1
022 - 023	M1523 registers
040 - 043	Timer 1
048 - 04B	Timer 2
060 - 06E	Keyboard controller
070 - 071	Real-time clock and NMI mask
080 - 08F	DMA page register
0A0 - 0A1	Interrupt controller-2
0C0 - 0DF	DMA controller-2
178 - 17A	6377 registers
1F0 - 1F7	Hard disk select
170 - 177	CD-ROM
3F6, 3F7	
220 - 22F	Audio (option)
240 - 24F	Audio (option) - default
260 - 26F	Audio (option)
280 - 28F	Audio (option)
278 - 27F	Parallel port 1
2E8 - 2EF	COM 4
2F8 - 2FF	COM 2
378 - 37A	Parallel port 2
3B4, 3B5, 3BA	Video subsystem
3C0 - 3C5	
3C6 - 3C9	Video DAC
3C0 - 3CF	Enhanced graphics display
3D0 - 3DF	Color graphics adapter
3E0 - 3E1	PCMCIA controller
3E8 - 3EF	COM3
3F0 - 3F7	Floppy disk controller
3F8 - 3FF	COM 1
CF8 - CFF	PCI configuration register

4.2.3.1 ALI M1521 (Memory, Cache and DRAM Controller)

The M1521 provides the system controller and data path components for the Extensa 900 Pentium-based system. It provides 64-bit CPU bus interface, 32-bit PCI bus interface, 64/72 DRAM data bus with ECC or parity, secondary cache interface including pipeline burst SRAM or asynchronous SRAM, PCI master to DRAM interface, four PCI master arbiters, and a UMA arbiter. The M1521 bus interfaces are designed to interface with 3V and 5V buses. It directly connects to 3V CPU bus, 3V or 5V tag, 3V or 5V DRAM bus, and 5V PCI bus.

4.2.3.1.1 Features of the ALI M1521

- Supports all Intel/Cyrix®/AMD 586-class processors (with host bus of 66 MHz, 60 MHz and 50 MHz at 3V)
- Supports M1/K5/Dakota™ CPUs
- Supports linear wrap mode for M1
- Supports asynchronous/pipeline-burst SRAM
- Write-back/dynamic write-back cache policy
- Built-in 8K* 2-bit SRAM for MESI protocol to cost and enhance performance
- Cacheable memory up to 512 MB with 11-bit tag SRAM
- Supports 3V/5V SRAMs for tag address
- Supports FPM/EDO/BEDO/SDRAM DRAMs
- RAS lines
- 64-bit data path to memory
- Symmetrical/asymmetrical DRAMs
- 3V or 5V DRAMs
- Duplicated MA[1:0] driving pins for burst access
- No buffer needed for RASJ and CASJ and MA[1:0]
- CBR and RAS-only refresh
- Supports 64M-bit (16M* 4, 8M* 8, 4M*16) technology DRAMs
- Supports programmable-strength MA buffer
- Supports error checking and correction (ECC) and parity for DRAM

- ♦ Supports the most flexible six 32-bit populated banks of DRAM (to spare 12 MB for Windows 95)
- ♦ Supports SIMM and DIMM
- ♦ UMA (unified memory architecture)
- ♦ Dedicated UMA arbiter pins
- ♦ Supports several protocols from major graphics vendors
- ♦ SFB size : 512 KB/1 MB/2 MB/3 MB/4 MB
- ♦ CPU could access frame buffer memory through system memory controller
- ♦ Alias address for frame buffer memory
- ♦ Fully synchronous 25/30/33 MHz 5V PCI interface
- ♦ PCI bus arbiter: five PCI masters and M1523 supported
- ♦ DWORDs for CPU-to-PCI Memory write posted buffers
- ♦ Convert back-to-back CPU to PCI memory write to PCI burst cycle
- ♦ DWORDS for PCI-to-DRAM write-posted/Read-prefetching buffers
- ♦ PCI-to-DRAM up to 133 MB/sec bandwidth (even when L1/L2 write-back)
- ♦ L1/L2 pipelined snoop ahead for PCI-to-DRAM cycle
- ♦ Supports PCI mechanism #1 only
- ♦ PCI spec. 2.1 support (N(16/8)+8 rule, passive release, fair arbitration)
- ♦ Enhanced performance for memory-read-line, memory-read-multiple, and memory-write-multiple
- ♦ Invalidates PCI commands
- ♦ DRAM refresh during 5V system suspend
- ♦ I/O leakage stopper for power saving during system suspend

4.2.3.2 ALI M1523 (PCI-ISA Bridge)

The M1523 provides a bridge between the PCI bus and the ISA bus and ensures full compatibility between the PCI and ISA functions. The M1523 has an Integrated System Peripherals (ISP) chip that provides advanced DMA controller features. This chip contains the keyboard controller, real time clock and IDE master controller. This chip also supports the Advanced Programmable Interrupt controller (APIC) interface.

One eight-byte bidirectional line buffer is provided for ISA/DMA master memory read/writes. One 32-bit wide posted-write buffer is provided for PCI memory write cycles to the ISA bus. It also supports a PCI to ISA IRQ routing table and level-to-edge trigger transfer.

The chip has two extra IRQ lines and one programmable chip select for motherboard Plug-and-Play functions. The interrupt lines can be routed to any of the available ISA interrupts.

The on-chip IDE controller supports two IDE connectors for up to four IDE devices providing an interface for IDE hard disks and CD-ROMs. The ATA bus pins are dedicated to improve the performance of IDE master.

The M1523 supports the Super Green feature for Intel and Intel compatible CPUs. It implements programmable hardware events, software event and external switches (for suspend/turbo/ring-in). The M1523 provides CPU clock control (STPCLKJ). The STPCLKJ can be active (low) or inactive (high) in turn by throttling control.

4.2.3.2.1 M1523 Features Summary

- Provides a bridge between the PCI bus and ISA bus
- PCI interface
- Supports PCI master and slave interface
- Supports PCI master and slave initiated termination
- PCI spec. 2.1 compliant (delay transaction support)
- Buffers
- 8-byte bidirectional line buffers for DMA/ISA memory read/write cycles to PCI bus
- 32-bit posted-write buffer for PCI memory write and I/O data write (for sound card) to ISA bus
- Provides steerable PCI interrupts for PnP PCI devices
- Up to eight PCI interrupts routing
- Level-to-edge trigger transfer
- Enhanced DMA controller
- Provides seven programmable channels (four for 8-bit data size, three for 16-bit data size)
- 32-bit addressability
- Provides compatible DMA transfers

- ♦ Provides type F transfers
- ♦ Interrupt controller
- ♦ Provides 14 interrupt channels
- ♦ Independently programmable level/edge triggered channels
- ♦ Counter/Timers
- ♦ Provides 8254 compatible timers for system timer, refresh request, speaker output use
- ♦ Keyboard controller
- ♦ Built-in PS2/AT keyboard controller
- ♦ The specific I/O is used to save the external TTL buffer
- ♦ Real time clock
- ♦ Built-in real time clock
- ♦ 128-byte CMOS RAM with 2
- ♦ Plug-and-Play port support
- ♦ Programmable chip select
- ♦ Steerable interrupt request lines
- ♦ PMU interface
- ♦ Supports CPU SMM mode, SMI feature
- ♦ Supports programmable stop clock throttle
- ♦ Supports the APM control
- ♦ Provides external suspend mode switch/turbo switch/ring-in switch
- ♦ Provides four system states for power saving (on, doze, standby, suspend)
- ♦ Provides three timers from 1 second to 300 minutes to individually monitor VGA, MODE, IN status
- ♦ Supports RTC alarm wake up control
- ♦ IDE interface
- ♦ Built-in PCI IDE master controller

- ♦ Supports PIO modes up to mode 5 timings, and multiword DMA mode 0, 1, 2
- ♦ 8 x 32-bit pre-read and posted-write buffers
- ♦ Dedicated pins for ATA interface
- ♦ Supports up to 256 KB ROM size decode
- ♦ Reserved USB interface
- ♦ 208-pin PQFP package

4.2.4 Video Subsystem

The video subsystem is implemented on the VGA Video Board and on the Main Board Assemblies.

The notebook contains a built-in LCD and features simultaneous LCD and external VGA display.

The video subsystem includes a 1.5 MB DRAM memory, 32-bit DRAM bus, and separate display and memory clocks. An additional frame buffer/accelerator DRAM increases the available memory band width for CPU accesses. The video section also uses additional levels of write FIFOs, a read cache, page mode DRAM.

Control of the video subsystem is provided by the C&T 65550 High Performance Flat Panel/CRT VGA Controller chip. The C&T65550 multimedia flat panel/CRT GUI accelerators provide 64-bit high performance and new hardware multimedia support features as described in the following paragraphs.

4.2.4.1 C&T 65550 Features

The C&T65550 integrates a powerful 64-bit graphics accelerator engine for Bit Block Transfer (BitBLT), hardware cursor, and other functions intensively used in graphical User Interfaces (GUls) such as Microsoft Windows. Superior performance is also achieved through a direct 32-bit interface to the PCI Local Bus.

4.2.4.1.1 Hardware MultiMedia Support

The C&T65550 implements independent multimedia capture (and display systems) on-chip. The capture system places data in display memory (usually off screen) and the display system places it in a window on the screen.

The capture system can receive data from either the system bus or from the ZV enabled video port in either RGB or YUV format. The input data can also scaled down before storage in display memory (e.g., from any size larger than 320 x 240 down to 352 x 248). Capture of input data may also be double-buffered for smoothing and to prevent image tearing.

The display system can independently place either RGB or YUV data from anywhere in display memory into an on-screen window which can be any size and located at any

pixel boundary (YUV data is converted to RGB "on-the-fly" on output). Non-rectangular windows are supported via color keying. The data can be functionally zoomed on output up to 8x to fit the onscreen window and can be horizontally and vertically interpolated to scale or zoom artifacts. Interlaced and non-interlaced data are supported in both capture and display systems.

4.2.4.2 Versatile Panel Support

The C&T65550 supports a wide variety of monochrome and color Single-Panel, Single-Drive (SS) and Dual-Panel, Dual Drive (DD) standard and high-resolution passive STN and active matrix TFT/MIM LCD, and EL panels. For monochrome panels, up to 64 gray scales are supported. Up to 4096 different colors can be displayed on passive STN LCDs and up to 16M colors on 24-bit active matrix LCDs. The C&T65550 offers a variety of programmable features to optimize display quality. Vertical centering and stretching are provided for handling modes with less than 480 lines on 480-line panels. Horizontal and vertical stretching capabilities are also available for both text and graphics modes for optimal display of VGA text and graphics modes on 800 x 600 and 1024 x 768 panels. Three selectable color-to-gray scale reduction techniques and SMARTMAP© are available for improving the ability to view color applications on monochrome panels. CHIPS®' polynomial FRC algorithm reduces panel flicker on a wider range of panel types with a single setting for a particular panel type.

4.2.4.3 Low Power Consumption

The C&T65550 employs a variety of advanced power management features to reduce power consumption of the display sub-system and extend battery life. Although optimized for 3.3V operation, the C&T65550 controller's internal logic, memory interface, bus interface, and panel interfaces can he independently configured to operate at either 3.3V or 5V.

4.2.4.4 Software Compatibility/Flexibility

The C&T65550 are fully compatible with VGA at the register and BIOS levels. CHIPS and third-party vendors supply fully VGA-compatible BIOS, end-user utilities and drivers for common application programs.

4.2.5 Sound Subsystem

The Extensa Series Notebook is equipped with an ESS1878 sound chip that is Sound Blaster™ and Sound Blaster Pro compatible. Internal stereo speakers provide the Notebook with sound generation capabilities. A set of 3.5 mm connectors allow for external microphone and line inputs and headphone/speaker outputs.

The sound subsystem also includes a variety of sound utilities that combine to provide additional multi-media functions.

4.2.5.1 ESS1878 Audio Controller with Interface to Expansion Audio Mixer

The ES1878 is a member of the ESS family of audio controllers that includes the ES1868. It shares most of the features of the ES1868 and includes new features, such

as support for the expansion audio mixer chip, the ES978, and a new IIS serial port and stereo D/A converter. A 4-wire expansion analog bus and 2-wire serial control bus connect the ES1878 and the ES978.

4.2.5.2 ES1878 Features

- ♦ Hot-dock interface to expansion audio mixer (ES978)
- ♦ Plug-and-Play support using internal resource ROM
- ♦ Monophonic full-duplex using two DMA channels
- ♦ Self-timed joystick port ("digital joystick")
- ♦ Support for up to 7 general purpose outputs and 7 general purpose inputs that can be slaved with corresponding pins of ES978 in expansion unit
- ♦ IIS interface to intemal stereo D/A for external ZV port or MPEG audio
- ♦ Completely general interrupt mapping, including sharing all interrupts

4.2.6 Keyboard Subsystem

The keyboard subsystem, implemented on the Keyboard Assembly and the Main Board Assemblies Board, consists of the following major sections:

- ♦ Keyboard Assembly
- ♦ Keyboard Scanner
- ♦ Status LED Interface

4.2.7 I/O Subsystem

The I/O subsystem is implemented with an NS87338VJG Super I/O Controller and the associated peripherals.

4.2.7.1 NS87338VJG Super I/O Controller

The PC87338VJG is a single chip solution for most commonly used I/O peripherals in ISA, and EISA based computers. It incorporates a Floppy Disk Controller (FDC), two full featured UARTs, and an IEEE 1284-compatible parallel port Standard PC-AT address decoding for all the peripherals and a set of configuration registers are also implemented in this highly integrated member of the Super I/O family. Advanced power management features, mixed voltage operation and integrated Serial-lnfrared (both IrDA and Sharp) support makes the PC87338 an ideal choice for low-power and/or portable personal computer applications.

The PC87338 FDC uses a high performance digital data separator eliminating the need for any external filter components. It is fully compatible with the PC8477 and incorporates a superset of DP8473, NEC PD765 and N82077 floppy disk controller

functions. All popular 5.25-inch and 3.5-inch floppy disk drives, including the 2.88 MB, 3.5-inch floppy disk drive, are supported. In addition, automatic media sense and 2 Mbps tape drive support are provided by the FDC.

The two UARTs are fully NS16450 and NS16550 compatible. Both ports support MIDI baud rates and one port also supports IrDA 1.0 SIR (with data rate of 115.2 Kbps), IrDA 1.1 MIR and FIR (with data rate of 1.152 Mbps and 4.0 Mbps respectively), and Sharp SIR (with data rate of 38.4 Kbps respectively) compliant signaling protocol.

The parallel port is fully IEEE 1284 level 2 compatible. The SPP (Standard Parallel Port) is fully compatible with ISA and EISA parallel ports. In addition to the SPP, EPP (Enhanced Parallel Port) and ECP (Extended Capabilities Port) modes are supported by the parallel port.

A set of configuration registers are provided to control the Plug and Play and other various functions of the PC87338. These registers are accessed using two 8-bit wide index and data registers. The ISA I/O address of the register pair can be relocated using a power-up strapping option and the software configuration after power-up.

When idle, advanced power management features allows the PC87338 to enter extremely low power modes under software control. The PC87338 operates at a 3.3/5V power supply.

4.2.7.1.1 PC87338 Features

- 100% compatible with ISA, and EISA architectures
- Floppy Disk Controller
- Software compatible with the DP8473, the 765A and the N82077
- 16-byte FIFO (disabled by default)
- Burst and Non-Burst modes
- Perpendicular Recording drive support
- New high-performance internal digital data separator (no external filter components required)
- Low-power CMOS with enhanced power-down mode
- Automatic media-sense support, with full IBM TDR (Tape Drive Register) implementation
- Supports fast 2 Mbps and standard 1 Mbps/500 kbps/250 kbps tape drives
- Bidirectional Parallel Port
- Enhanced Parallel Port (EPP) compatible

- Extended Capabilities Port (ECP) compatible, including level 2 support
- Bidirectional under either software or hardware control
- Compatible with ISA, and EISA, architectures
- Ability to multiplex FDC signals on parallel port pins allows use of an external Floppy Disk Drive (FDD)
- Includes protection circuit to prevent damage to the parallel port when a connected printer is powered up or is operated at a higher voltage
- UARTs
- Software compatible with the PC16550A and PC16450
- MIDI baud rate support
- Infrared support on UART2 (IrDA 1.0 SIR, IrDA 1.1 MIR and FIR, and Sharp SIR)
- Address Decoder
- 6 bit or 10 bit decoding
- External Chip Select capability when 10 bit decoding
- Full relocation capability (no limitation)
- Enhanced Power Management
- Special configuration registers for power-down
- Enhanced programmable power-down FDC command
- Auto power-down and wake-up modes
- 2 special pins for power management
- Typical current consumption during power-down is less than 10 μA
- Reduced pin leakage current
- Voltage support
- 3.3/5V operation
- General Purpose Pins
- 1 pin, for 2 separate programmable chip select decoders, can be programmed for game port control
- Plug and Play Compatible

- 16 bit addressing (full programmable)
- 10 selectable IRQs
- 4 selectable DMA Channels
- 3 SIRQ Inputs allows external devices to mapping IRQs
- 100-pin TQFP package - PC87338VJG

4.2.8 Hard Disk Drive Subsystem

The Hard Disk Drive Subsystem, implemented on the Main Board Board and on the associated hard disk drive module(s), provides disk storage for all system software and user files.

The notebook is equipped with a high-capacity hard disk drive. The hard disk drive also features built-in power conservation features configured from the standard CMOS Setup Routine. An Automatic Power Down mode can be selected which powers down the drive motor during periods of inactivity. An additional level of power conservation may also be selected which powers down the motor plus all control circuits.

The hard disk drives are factory formatted as a single drive (Drive C:) and are preloaded with installation versions of Windows 95 or Windows for Workgroups (in dual load versions, the user selects operating system during software installation).

The Hard Disk Controller is implemented with the PCIO643 Controller Chip described in greater detail in the following paragraph.

4.2.8.1 PCI0643 Features

- Capable of 16 MB/second transfer rates in DMA mode - up to 20 MB/second in PIO mode
- Supports bus master DMA at 133 MB/second PCI burst rate
- Support PCI DMA transfers for both DMA-capable and PIO-only drives
- Fully supports ATAPI DMA/PIO transfers
- 2 channels - supports up to 4 IDE drives
- Surpasses and supports Enhanced IDE Mode 3, Mode 4 and propose Mode 5 timing from the widest range of disk drive manufacturers
- Supports multi-word and single-word DMA modes 0, 1 and 2
- Fully supports the latest PCI-IDE specification and all the Plug-and-Play (PnP) specifications.
- Supports Windows 95, Windows NT 3.1 and 3.5 (Daytona), and OS/2™

- ♦ CMD's complete set of 32-bit drivers handle both DMA and PIO
- ♦ Fully compatible with the latest PCI, PCI IDE, ATA-2, Enhanced IDE, Fast IDE, ATAPI, plug and play, and ATA-2 Power Management Feature Set
- ♦ Fully supports all ATAPI-compatible devices, including CD-ROM, tape, MO, and other devices
- ♦ Fully supports legacy (IRQ 14 and 15)
- ♦ Hardware and software mode switching and chip enable/disable capabilities
- ♦ Programmable read-ahead and write-back buffers enhance transfer rates
- ♦ Fully compatible with all major operating systems
- ♦ 100-pin PQFP

4.2.9 Floppy Disk Drive Subsystem

The Extensa 900 is equipped with a 3.5-inch floppy disk drive that can read/write standard 3.5-inch disks (either1.44 MB or 2 MB capacity). The drive can also read a 720 KB disk (for interchange of data with other computers).

The data transfer rate for the floppy disk drive is 500 Kbits per second for high-density disks and 250 Kbits per second for double-density disks.

The floppy drive controller is implemented on the PC87338 Super I/O Controller chip described in the previous paragraphs.

4.2.10 PCMCIA Subsystem

The notebook is equipped with a PCMCIA subsystem that accomodates either two Type I or Type II PCMCIA cards or one Type III card. The heart of the PCMCIA Subsystem is the TI PCI 1130 high-performance PCI-to-PC Card controller that supports two independent PC Card sockets compliant with the 1995 PC card standard. The PCI 1130 provides a set of features that make it ideal for bridging between PCI and PC Cards in both notebook and desktop computers. The 1995 PC Card standard retains the 16-bit PC Card specification defined in PCMCIA release 2.1 and defines the new 32-bit PC Card, called CardBus, capable of full 32-bit data transfers at 33 MHz. The PCI 1130 supports any combination of 16-bit and CardBus PC Cards in its two sockets, powered at 3.3V or 5V as required.

The PCI 1130 is compliant with the PCI local bus specification revision 2.1, and its PCI interface can act as either a PCI master device or a PCI slave device. The PCI bus mastering is initiated during 16-bit PC Card DMA transfers or CardBus PC Card bus mastering cycles.

All card signals are internally buffered to allow hot insertion and removal without external buffering. The PCI 1130 internal data path logic allows the host to access

8-, 16-, and 32-bit cards using full 32-bit PCI cycles for maximum performance. Independent 32-bit write buffers allow fast-posted writes to improve system-bus utilization.

An advanced CMOS process is used to achieve low system-power consumption while operating at PCI clock rates up to 33 MHz. Several low-power modes allow the host power-management system to further reduce power consumption.

4.2.10.1 PCI 1130 Features

- 3.3V core logic with universal PCI interface compatible with 3.3V or 5V PCI signaling environments
- Supports PCI Local Bus specification 2.1
- Mix and match 3.3V/5V PC card 16 cards and 3.3V CardBus cards
- Supports two PC card or CardBus slots with hot insertion and removal
- 1995 PC Card standard compliant
- Low-Power advanced submicron CMOS technology
- Uses serial interface to Texas Instruments (TI) tps2202a dual power switch
- System interrupts can be programmed as PCI-Style or ISA IRQ-Style interrupts
- ISA IRQ interrupts can be serialized onto a single IRQSER pin
- Independent read and write buffers for each direction
- Supports burst transfers to maximize data throughput on the PCI and CardBus bus
- Multifunction PCI device with separate five PCI Memory Windows and two I/O Windows available to each PC Card 16 socket
- Two l/O Windows and two memory windows available to each CardBus socket
- CardBus Memory Windows can be individually selected prefetchable or non-PREFETCHABLE
- ExchangeableCard (ExCAT)-compatible registers are mapped in memory and I/O space
- TI extension registers are mapped in the PCI configuration space
- Intel 82365SL DF register compatible
- Supports 16-bit distributed Direct Memory Access (DMA) on both PC Card sockets

- Supports PC/PCI DMA on both PC Card sockets
- Supports Zoom Video Mode
- Supports Ring Indicate
- Packaged in 208-pin Thin Plastic Quad Flatpack (PDV)

4.2.11 Power Subsystem

The notebook is equipped with a software/hardware monitored/controlled Power Subsystem that minimizes battery usage for prolonged battery operation and automatically recharges the batteries when the notebook is used with an AC adapter.

The control for the power subsystem is implemented with the ALI M6377 Power Management Unit chip as described below.

A simplified block diagram of the power subsystem is shown in Figure 4-3.

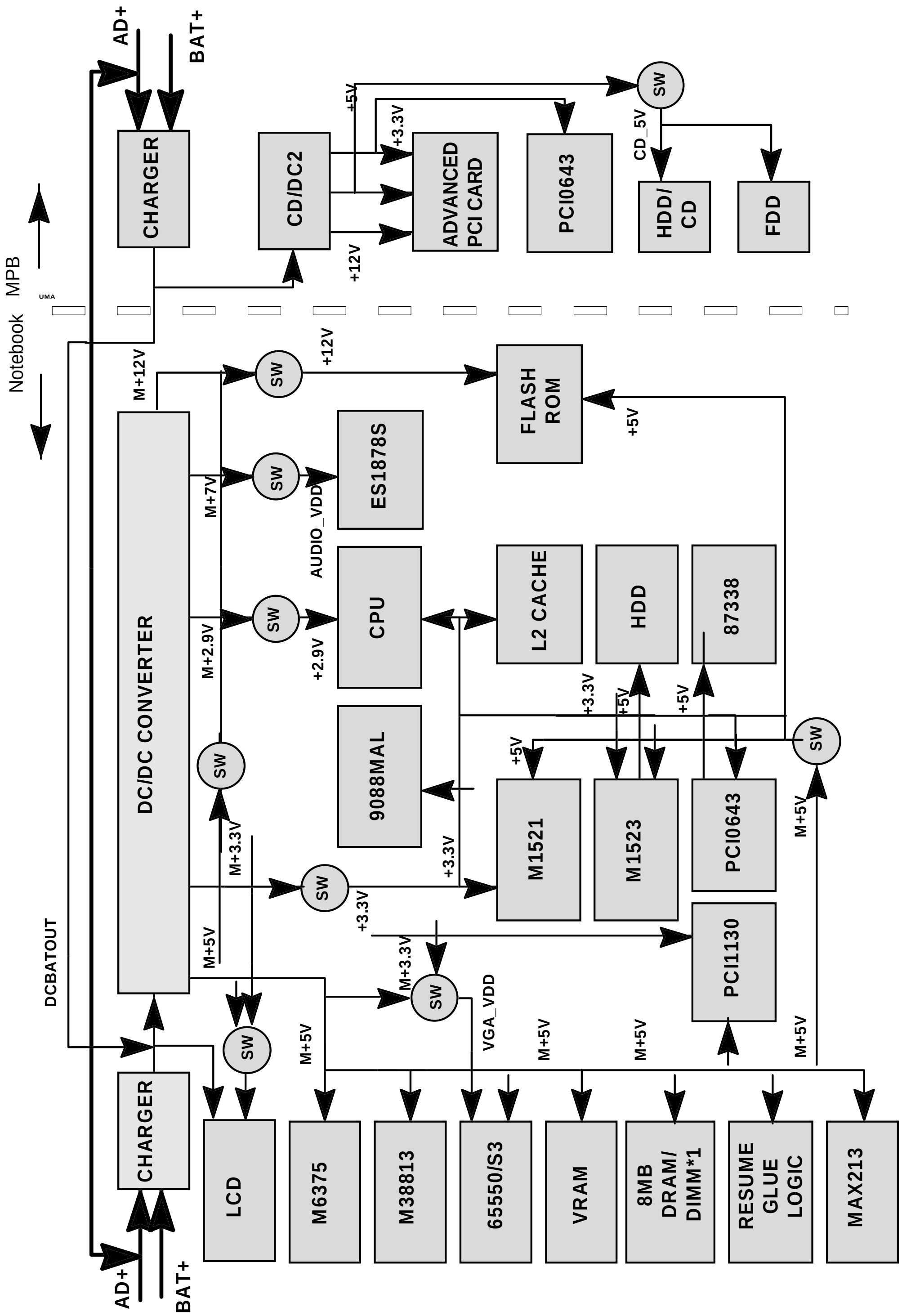


Figure 4-3 Power Subsystem Simplified Block Diagram

4.2.11.1 ALI M6377 Power Management Unit

The major features of the ALI M6377 Power Management Unit include:

- Three operation states
  - — ON state
  - — DOZE state
  - — SLEEP state
- Programmable DOZE and SLEEP timers
- Programmable EL timer for backlight control
- Three output pins depending on operation state, each pin is programmable and power configurable.
- Provide system activity monitoring, including:
- Video
- Hard disk drive
- Floppy disk drive
- Serial port
- Keyboard
- Parallel port
- Two programmable I/O groups activity monitor, each group contains 16/8 I/O addresses.
- One predefined I/O group activity monitor
- Multiple external wake up events from DOZE and SLEEP states
- External push button
- RTC alarm
- Two levels battery warning monitor

Port definitions for the M6377 Chip are provided in Table 4-5.

Table 4-5 M6377 GPIO Port Definitions

Item	Description
GPIO17 (W/R)	1: Connect serial BUS with charger ROM. 0: Disconnect serial BUS with charger ROM. GPIO20 is the CLK and GPIO21 is the DATA for the serial BUS.
GPIO16	Reserved
GPIO15 (W/R)	1: CPU high temperature SMI is allowed. 0: CPU low temperature SMI is allowed.
GPIO14 (W/R)	1: Connect the ZV BUS with PCMCIA card. 0: Connect the ZV BUS with Feature board.
GPIO13 (W)	1: Force the system to enter 0V suspend or power down mode, and then could press power button to turn on system again. 0: Normal
GPIO12 (W/R)	1: Force FAN on 0: Normally
GPIO11 (W/R)	1: Enable+12V power foor FLASH ROM. 0: Disable+12V power.
GPIO10 (W/R)	1: Disable FIR VCC. 0: Enable FIR VCC.
GPIO27 (R)	1: CPU high temperature. 0: CPU low temperature.
GPIO26 (W/R)	1: notebook's SMBUS is accessible. 0: MPB's SMBUS is accessible.
GPIO25 (W/R)	1: Brightness level is fixed 0: Brightness is trimable via GPIO22 & GPIO20. The current brightness level is stored when PIO25 low to high transations.
GPIO24 (W/R)	For DSTN LCD only. 1: Contrast level is fixed. 0: Contrast is trimable via GPIO22 & GPIO20. The current brightness level is stored when PIO25 low to high transations.
GPIO23	1: Normally 0: Ready to transations.
GPIO22 (W/R)	The Brightness & Contrast for LCD system is devided into 32 scale by programing GPIO22 & GPIO20. 1: Brightness is incremented with GPIO23 "L" and GPIO20 high to low transations. Contrast is incremented with GPIO24 :L" and GPIO20 high to low transations. 0: Brightness is decremented with GPIO24 "L" and GPIO20 high to low transations. Contrast is decremented with GPIO23 "L" and GPIO20 high to low transations.
GPIO21 (W/R)	The system provide a serial BUS while wired to Inverter ROM, notebook's Charger ROM, MPB's Charger ROM and Uma's dock ROM. GPIO21 is the serial DAT and GPIO20 is the serial CLK.

Table 4-5 M6377 GPIO Port Definitions (Continued)

Item	Description
GPIO20 (W/R)	GPIO20 is the common CLK for below serial BUS: A. For Charger ROM, Inverter ROM, MPB ROM serial BUS. B. For Brightness & Contrast control. C. For Feature board.
GPIO37 (W/R)	GPIO37 is serial DATA for Feature board serial BUS, and GPIO20 is the serial CLK.
GPIO36 (W/R)	1: Normally 0: Disable MPB power.
GPIO35 GPIO34 GPIO33 (W/R)	The system use 3-wire BUS to communicate with thermal sensor (DS1620). These functions are shown as below: GPIO35 1: Enable DS1620. 0: Disable DS1620. GPIO34 is CLK for 3-wire BUS . GPIO33 is DATA, must be valid during the rising edge of CLK(GPIO34).
GPIO32 (W/R)	1: Normally 0: System into STANDBY mode.
GPIO31 (W/R)	1: Enable 1394 power. 0: Disable 1394 power.
GPIO30 (W/R)	1: Go to 5V suspend. 0: Normally
SE12 (W)	1: Normally 0: Disable notebook's OP amplify.
SE11(W) SE10(W)	Reserved
GPIO7	1: Media bay switch is unlocked. 0: Media bay switch is locked.
GPIO6	1: MPB is connected. 0: MPB is disconnected.
GPIO5	received
GPIO2	1: No FDD connected. 0: FDD connected.
GPIO1	0: No 2nd channel IDE device connected 1: 2nd channel IDE device connected.
GPI00	1: Parallel port connected with FDD while the parallel port SMI occured. 0: Parallel port connect with printer.

4.2.11.2 AC Power Adapter

The computer is equipped with a universal AC power adapter that converts AC voltage into DC voltage (approx. 46 Watts of power) used to operate the notebook and charge the batteries. The specifications for the AC adapter include:

- Input Voltage: 100 to 250 VAC
- Input Current: Approximately 1.5 Amps
- Input Frequency: 50 to 60 Hz

4.2.12 Mobile Productivity Base Interface

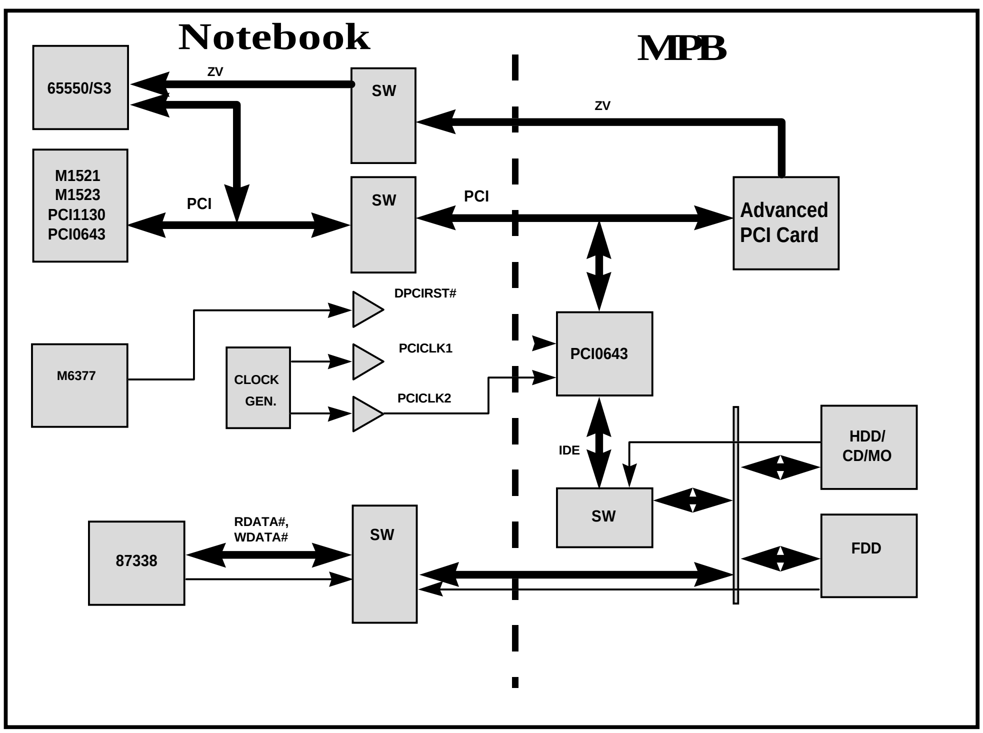


Figure 4-5 MPB Interface Diagram

5
Troubleshooting Procedures

5.1 Introduction

This section provides an overview of the fault isolation process, provides guidelines for isolating 900 Series computer malfunctions to replaceable subassemblies and provides instructions for executing diagnostics and interpreting error messages.

5.2 Overview of Fault Isolation Process

The fault isolation process (summarized in Figure 5-1) consists of the following steps:

- ♦ Checking the Notebook power system (including battery packs and AC adapter connections) - refer to Paragraph 5.4.
- ♦ Checking Switch settings (ensuring **Power** is On and notebook correctly configured)
  - Pressing the **Shift** key to ensure that Notebook is not in **Suspend mode**
  - Verifying if computer is configured to boot from the A: Drive or C: Drive
  - Checking LCD brightness adjustment (press **Fn-Up Arrow** keys to increase brightness)
  - Ensuring that computer is not set for external monitor (press **Fn-F12** to select internal screen)
- ♦ Undocking from the Mobile Productivity Base (if installed) and running diagnostics to isolate problem to either the base or the notebook.
- ♦ Recording and attempting to resolve any displayed error messages or error beeps (refer to Paragraph 5.3.3.1 and Tables 5-1 and 5-2)
- ♦ Rebooting the system (**Ctrl-Alt-Del**)
- ♦ If the computer is capable of running the Setup program; checking the serial and parallel port configurations, Sound System enable/disable, and other features that may affect system operation.
- ♦ Running PC-Doctor Diagnostics to further isolate problem area (refer to Paragraph 5.5). For indicated hardware failures, cycling power and repeating self test to verify that a hard failure has occurred.
- ♦ Removing and replacing suspect hardware (as described in Section 6 of this manual) and retest the system using the diagnostic tests as described in Paragraph 5.4.5.

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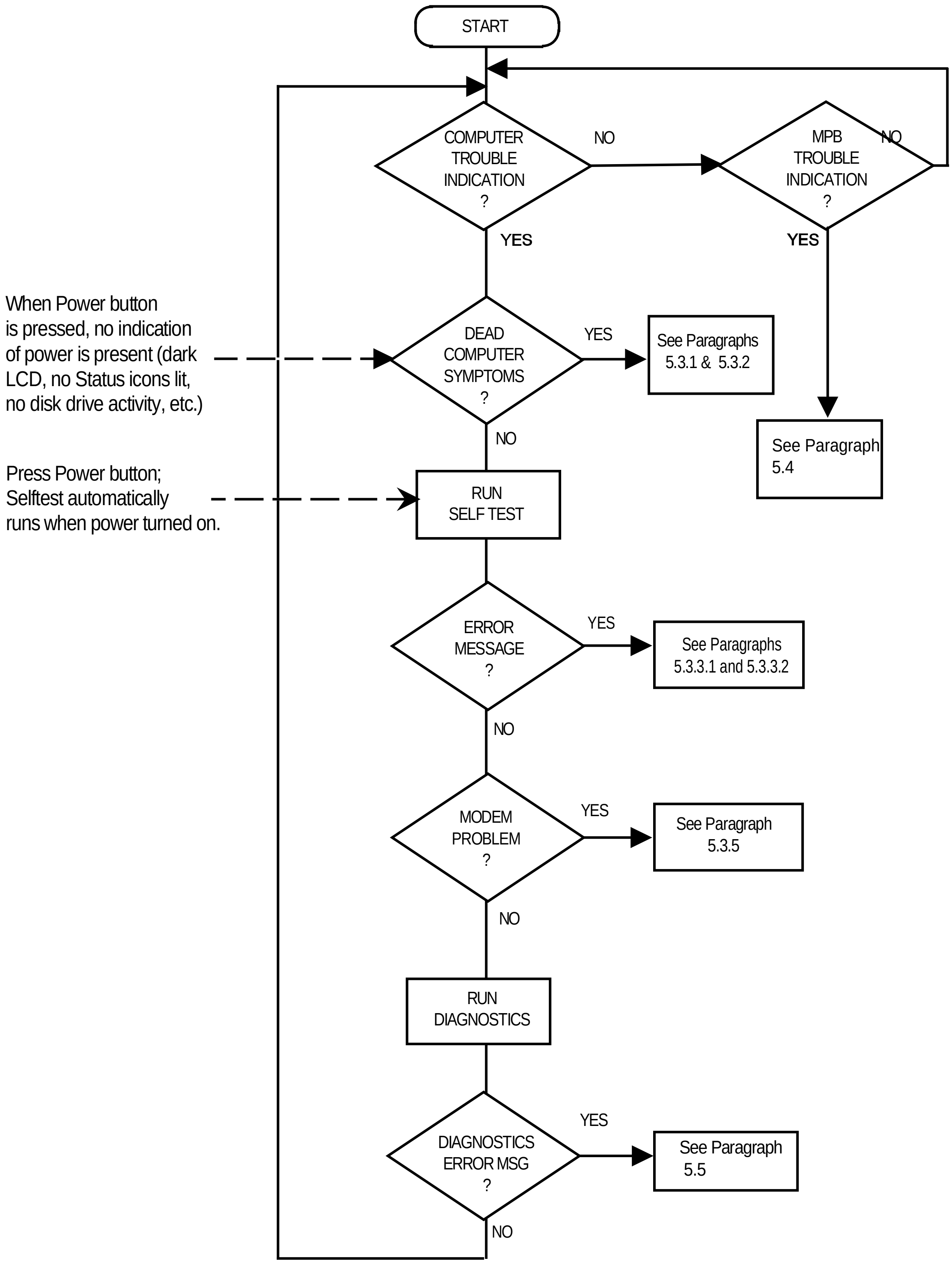


Figure 5-1 Notebook Computer Troubleshooting Flow Chart

5.3 Troubleshooting Procedures

The built-in self test program and the disk resident diagnostics program (PC-Doctor) are useful tools in computer troubleshooting. However, if the computer has a power, keyboard or display problem, you must first solve this problem before running diagnostics. If the computer powers up and displays messages on the LCD or emits a series of beeps, skip to Paragraph 5.3.3.1 for further instructions.

5.3.1 Troubleshooting a Power Supply Problem

If the computer does not power up when the Power Switch is pressed, you most likely have a malfunction in the power subsystem (loss of power at the AC outlet, faulty AC adapter, discharged Battery Packs, or faulty Power Supply on the Main Board). With a power problem, all LEDs are extinguished, the LCD screen is blank, the system does not respond when the suspend switch is pressed several times consecutively and no drive activity can be heard. The computer is unable to load software and displays no visible signs of activity. To fault isolate a power problem, check the following:

- AC adapter and Battery - Plug in the AC adapter and double-check all connections on the adapter and computer. Ensure that the Notebook **Power** switch is set to the On position and that the system is not in **Suspend** or **Sleep** mode.
- Measure the voltage at the AC outlet or plug in a known good appliance (e.g., a lamp) to verify that voltage is present. If the voltage is okay, try replacing the AC adapter.
- Check to see that a charged battery pack is installed correctly; also attach the AC adapter and connect to live wall outlet. If the AC outlet voltage, AC adapter, and battery packs test normal but the computer will not power up, try the DC-In PWB, Power Supply PWB, Main Board PWB or LED PWB.

5.3.2 Troubleshooting a Display Problem

If the LCD remains blank when you turn on the computer, and the status indicators light, check the following controls on the display:

- LCD suspend mode - Press **Shift** to terminate Suspend mode.
- Brightness set too low - Press **Fn-Up Arrow** keys to increase screen brightness
- Notebook Set for External Monitor - Press **Fn-F12** to switch to the internal screen.
- Faulty LCD - Replace the cover-display assembly as described in Section 6 of this manual.
- Low battery - Use a fully charged battery and/or plug in the AC adapter.

Table 5-1 contains fault isolation information for Display Problems on the notebook. Symptoms are listed along the left side of the chart and the various Display FRUs are listed along the top of the chart. Within the body of the table are the probabilities of each of the FRUs causing that particular problem. For example, a single display line on the screen is most likely caused by the LCD Panel or Display Cable; other components have a low probability of causing the problem.

Table 5-1 Display Troubleshooting Guide

Problem Description	Inverter Board	LCD Panel	Display Cable	Mother Board	BIOS
Single line on LCD display (horizontal or vertical)	Low	High	Medium	Low	Low
Multiple lines on display (horizontal or vertical)	Low	Medium	Medium	Low	Low
Sections of the display are missing characters	Low	Medium	Medium	Low	Low
Scrambled Display	Low	Medium	Low	Medium	Medium
Intermittent characters on display	Low	Medium	Medium	Medium	Low
Bright display, no visible characters	Low	Medium	Medium	Medium	Low
Brightness level fluctuating or display blinking on/off	High	Low	Medium	Low	Low
Display goes dim over time	High	Medium	Low	Low	Low
Dim display but characters very visible	Medium	Medium	Low	Low	Low
Very dark display and characters are slightly visible when a light is directed at surface of the display	High	Low	Low	Low	Low
Very dark display and no characters are visible	Low	High	High	Medium	Low

5.3.3 Fault Isolation Using Power On Self Test

When the computer is first powered up, it automatically performs a Power On Self Test (POST) that checks the notebook's central hardware and memory functions. During POST (which lasts for a few seconds), the display shows copyright and version number information.

Note: Some procedures in this paragraph require you to use keystroke sequences, such as **Ctrl-Alt-Del**. To execute a keystroke sequence such as this, you must press all three keys simultaneously.

5.3.3.1 POST Error Messages

Upon successful completion of Power On Self Test, the computer automatically loads its operating system and other built-in utilities. If POST fails to complete successfully, the display shows one of the error messages described in Table 5-2.

Note: In the event of a hardware problem that affects the display, the Notebook also communicates errors via a series of beeps. The interpretation of the beep codes is provided in Table 5-3.

Note: Refer to Appendix C for POST BIOS listing.

Table 5-2 Power On Self Test Error Messages

Message	Possible Cause	Action
Diskette drive A failure	The drive failed or is missing.	Check the drive to determine the problem.
Diskette read failure - press F1 to retry boot, F2 for SETUP utility	The disk is either not formatted or is defective.	Replace the disk with a bootable disk and retry.
Display adapter failed, using alternate	The primary video adapter failed.	Check the primary video adapter.
Gate A20 failure	The keyboard controller is not accepting command, specifically, the enable and disable A20 command.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists contact qualified service personnel .
Fixed disk configuration error	The specified configuration is not supported or doesn't match the actual hardware installed.	Correct the fixed diskette configuration.
Fixed disk controller failure	The fixed diskette may be defective.	Try rebooting. If that doesn't work, replace the fixed diskette.
Fixed disk read failure- press F1 to retry boot, F2 for SETUP utility	The fixed diskette may be configured incorrectly or is defective.	Check the drive type selected in Setup. Try rebooting. If that does not work, replace the fixed diskette.
Pointer device failure	The PS/2-style mouse failed.	Try rebooting. If problem persists, check the mouse, cable and connector.

Table 5-2 Post Error Messages (continued)

Message	Possible Cause	Action
No boot device available - press F1 to retry boot, F2 for SETUP utility	Either disk drive A:, the fixed diskette, or both the disk and fixed diskette are defective.	Try rebooting. If the problem persists, replace the disk or the fixed diskette.
No boot sector on fixed disk - press F1 to retry boot, F2 for SETUP utility	The C: drive is not formatted or is not bootable.	Format the C: drive and make it bootable.
Not a boot diskette - press F1 to retry boot, F2 for SETUP utility	The disk in drive A: is not formatted as a bootable disk.	Replace the disk with a bootable disk and try rebooting.
No timer tick interrupt	The timer chip has failed.	Check the system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Shutdown failure	Either the keyboard controller is not accepting the reset command or the associated reset logic has failed.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Time of day not set - run SETUP program	Real time clock not set.	Run the Setup utility.
Timer 2 failure	The timer chip has failed.	Check the system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
F2 to enter ROM-based SETUP	Invalid configuration information must be changed.	You must run the Setup utility and correct configuration information.
Invalid configuration information - please run SETUP	Display adapter is configured incorrectly. Memory size is incorrect. Wrong number of disk drives. Other configuration errors.	Run the Setup utility.

Table 5-2 POST Error Messages (continued)

Message	Possible Cause	Action
Keyboard clock line failure	The keyboard, the keyboard cable connection, or the keyboard controller is defective.	Make sure the keyboard cable and keyboard are connected properly. Check the keyboard controller and the system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Keyboard data line failure	The keyboard controller firmware has failed.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Keyboard stuck key failure	A key is jammed.	Locate the jammed key and fix it. Make sure the keyboard cable and keyboard are connected properly. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Memory failure at hex-value, read hex-value, expecting hex-value	Circuitry associated with the memory chips has failed.	Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Unexpected interrupt in protected mode	Hardware interrupt or NMI occurred while in protected mode.	Check the timer chip or the interrupt controller on the system board.
Real time clock failure	The RTC or battery failed.	Run Setup and turn the power off and on. If the problem persists, replace the RTC battery. If the problem remains, contact qualified service personnel.

5.3.3.2 POST Beep Error Messages

In the event of a hardware problem that affects the display, the Notebook also communicates errors via a series of beeps. These codes may be heard over the system's speaker as a series of beeps (long and short duration). The interpretation of the beep codes is provided in Table 5-3.

To recover from a self test error, try cycling power to the computer. Also, press **Ctrl-Alt-Esc** to ensure that the Setup configuration is correct. In general, most of the

failures are associated with the Upper and Lower Electronics Boards and may require board removal/replacement.

Try running PC-Doctor (Paragraph 5.5) if possible to verify the source of problem.

Table 5-3 Self Test Beep Messages

Beep Code	Description
VGA Failures	
1 Long, 2 Short	Horizontal Retrace Failed
1 Long, 3 Short	DAC Test Failed
1 Long, 4 Short	Monitor Sense Failed
1 Long, Five Short	Vertical Retrace Failed
1 Long, 6 Short	DVideo Memory Test Failed
System Failures	
2 Short	Battery Low 1
3 Short	Battery Low 2

5.3.4 Run-Time Error Messages

In the event of a hardware/software error that occurs after completion of POST, the error messages listed and described in Table 5-4 may occur.

Table 5-4 Run-Time Error Message Troubleshooting

Message	Cause	Action
I/O card parity interrupt at address. Type (S)hut off NMI, (R)eboot, other keys to continue	Memory on a peripheral card has failed.	Check the memory cards installed in the system.
Memory parity interrupt at address. Type (S)hut off NMI, (R)eboot, other keys to continue	A memory chip(s) has failed.	Check the memory on the system board.
Unexpected HW interrupt, interrupt at address. Type (R)eboot, other keys to continue	Hardware problem. Not displayed if the expected interrupt handler is not enabled.	Check all hardware in the system.
Unexpected SW interrupt, interrupt at address. Type (R)eboot, other keys to continue	Error(s) in the software program. Not displayed if the extended interrupt handler is not enabled.	Turn the machine off and then on again. If doesn't work, check the program.
Unexpected type 02 interrupt at xxxxh. Type (S)hut off NMI, (R)eboot, other keys to continue	A parity error occurred, but the source can not be determine.	Turn the power off and then on again.

5.3.5 PCMCIA Modem Problems

If an optional PCMCIA modem does not work properly, check the following items:

- ♦ Dialing problem or wrong number - Try dialing a number that you have previously dialed successfully.
- ♦ Faulty phone line - Connect a telephone to the line and listen for a dial tone.
- ♦ Software program - Check to ensure that you have installed the software correctly.

5.4 General Fault Isolation Procedures

If troubleshooting a sytem containing a docked MPB, try undocking the Notebbok and tracing the malfunction to either the notebook or the MPB.

Table 5-5 contains a summary of general problems that may occur during operation of the notebook and the appropriate corrective actions that should be taken for each. For other symptoms, go on to Paragraph 5.5 and troubleshoot the notebook using PC Doctor Diagnostics.

Table 5-5 General Troubleshooting Procedures

Problem	Corrective Actions
No power	1. Check that the AC adapter is plugged into the power connector of the system. Also, check that the AC adapter is plugged into a properly grounded AC power outlet. 2. If using the battery as main power source, check if the battery pack is of the right type, charged, and is inserted correctly. 3. Check the powerboard of the system. Is it inserted into the motherboard connector properly? Otherwise, replace the powerboard.
Data on the LCD is unreadable	1. Adjust the brightness and contrast display controls. 2. Check if the LCD cables are inserted properly. Check connections inside the LCD panel. 3. Verify if installed VGA driver is correct. 4. Check VGA controller chip on the motherboard to see if there is any cold or loose soldering. 5. Replace the motherboard.

Table 5-5 General Troubleshooting Procedures (continued)

LCD screen does not show data	1. Check the LCD Status Bar if Suspend mode is activated. Press any key or press the power button to resume operation and display. 2. Check if LCD cables are disconnected or loose. 3. Check if the display output is switched to the external monitor. 4. Verify that the Contrast level is set to minimum. 5. Check if there is power. 6. Replace the LCD Inverter board found inside the LCD Panel.
Battery Power does not last	1. Make sure that the power management features are enabled. 2. Recharge the battery pack for 1.5 hours before using again. 3. Replace the battery pack.
System halts during boot sequence	1. Check condition of selected bootload device (disk or hard disk) for bad boot track or incorrect OS files. 2. Try booting from a new bootable disk and recopy or repartition hard disk drive. 3. Check for any BIOS error messages on the display screen. 4. Replace motherboard.
I/O processing malfunctions	1. Check the connections of all internal devices. 2. Replace motherboard.
Diskette drive does not work	1. Check if floppy disk drive cable is connected properly. 2. Check disk type if correct and not faulty. 3. Replace disk drive. 4. Replace motherboard.
Hard disk drive malfunction	1. Check if hard disk drive is set properly on CMOS Setup. 2. Check drive cables and connections. 3. Check if hard disk drive is good. 4. Replace the motherboard.

Table 5-5 General Troubleshooting Procedures (continued)

Memory malfunction	1. Check if the memory module is inserted properly. 2. Replace the memory module. 3. Replace the motherboard.
External keyboard or PS/2 mouse doesn't work	1. Check if the keyboard or the mouse are connected properly. Check if the Y-cable is being used. Power off system first before plugging in the device. 2. Replace the keyboard or mouse. 3. Replace the motherboard.
PCMCIA card does not work	1. Check the PCMCIA driver installation for any IRQ or I/O address conflicts. 2. Check if the PCMCIA card is inserted properly and all connections are set. 3. Replace the PCMCIA card. 4. Replace the motherboard.
Mouse doesn't work	1. Check if PS/2 mouse driver is properly installed. 2. Check the keyboard controller chip for any cold or loosed soldering. 3. Replace the motherboard.
Serial device does not work	1. Check if serial driver is correctly configured. 2. Check if serial device is connected properly. 3. Replace serial device. 4. Check the I/O controller chip on the motherboard for any cold or loosed soldering. 5. Replace the motherboard.
Parallel device does not work	1. Check if all connections are properly set. 2. Check if external device is turned on. 3. Check I/O controller chip on the motherboard for any cold or loose soldering. 4. Replace the motherboard.

5.5 Fault Isolation Using Diagnostics

PC-Doctor, supplied with the Extensa Series Notebooks, is a powerful diagnostics tool that can help you determine the hardware configuration of a local or remote system, benchmark its performance, analyze the performance of all subsystems, and perform a suite of interactive and non-interactive tests on attached devices (such as printers, joystick devices, VGA monitors, SCSI® devices, CD-ROM drives). The test results are stored in a log which can be printed out or saved in a disk file.

5.5.1 PC-Doctor (In DOS Mode or DOS Window)

Features of the diagnostic program are accessed through a series of pull-down menus and basic keyboard keys (cursor keys to move highlighted pointer, **Enter** key to select a highlighted feature, **Esc** key to cancel a function and move back one level.

PC-Doctor is typically user friendly but if you don't understand a feature, context-sensitive "help" information is available at any time by pressing the **F1** function key; pressing the **F1** function key twice accesses the online Technical Reference Manual for PC-Doctor.

A powerful set of utilities within PC-Doctor (that can be run locally or remotely) simplify the task of determining system configuration data, allocating and using system memory, IRQ and DMA use, what device drivers are installed, what COM and LPT ports are assigned and what ports are available, identifying partitioning data for fixed disk drive(s), determining the VGA setup information, reading the software interrupts/ interrupt vectors, etc.

Functionally, PC-Doctor includes the following:

- ♦ Group of non-Interactive diagnostic tests that perform a non-destructive test of the major hardware functions in the notebook (Processor, Memory, System board, video section, serial and parallel ports (when loopback adapters are installed), hard disk drive and floppy disk drive).
- ♦ Group of Interactive tests (require operator input) for testing the keyboard, video sections, sound subsystem, mouse, joystick, disk drive, printer subsystem and the SCSI/CD-ROM Drive subsystems supported by the docking station options.
- ♦ Utility that provides detailed system information such as configuration data, allocation and use of system memory, IRQ and DMA use, what device drivers are installed, what COM and LPT ports are assigned and what ports are available, partitioning data for fixed disk drive(s), VGA setup information, software interrupts and interrupt vectors, and installed SCSI options.
- ♦ Group of special purpose utilities to run other tests from PC-Doctor, perform a virus scan of the system, edit configuration files, surface scan hard drives, measure system performance, open a DOS prompt, provides terminal access to devices connected to serial ports, supports memory debug operations, enables remote operations, permits deep discharge of notebook batteries and provides an extensive test reporting function.

5.5.2 Supporting Online Documentation

The PC-Doctor Diagnostic contains the following online information sources:

- ***Online Technical Manual*** - Selected at any time by pressing **F1** key twice or by clicking on the Question Mark in the upper left hand corner of any PC-Doctor Menu
- **On-line Help system** - Provides context sensitive information from every PC-Doctor screen- accessed by pressing **F1** key once (pressing **F1** twice gets you into the online manual)

5.5.3 User Interface to PC-Doctor

PC-Doctor is structured as a text-mode, windowed user interface with pull-down menus. Program operation requires the use of the following keys:

- **Cursor Keys** - Moves the highlighted pointer
- **Enter** Key - Selects the highlighted option
- **Esc** Key - Cancels current function and goes back one step
- **F1** Key - Activates the context-sensitive help feature (pressing **F1** twice in a row calls up the online Technical Reference Manual for PC-Doctor)

Scrolling windows, which show the results of various operations, use the following keys:

- **Page Up/Page Down** - Moves the screen one page at a time
- **F2** - Prints the log to PRN
- **F3** - Saves the log to a file

You can also use the mouse or Point to interact with PC-Doctor. The leftmost **Select** key is used to choose objects (menu entries and action codes typically enclosed in brackets). The rightmost **Select** key is equivalent to the **Esc** key which takes you back to your previous step.

5.5.4 Quitting PC-Doctor

To exit PC-Doctor, select the **Quit** pull down menu and then select the **Quit** option.

Note: For additional information, access the *Online Reference Manual* for PC-Doctor.

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6 Field Service

6.1 Introduction

This section contains general preventive and corrective maintenance procedures that apply to all members of the Extensa 900 Notebook family. The first part of the section describes the computer cleaning procedures and preferred handling procedures for sensitive components (e.g., disk drives, batteries).

The second part of the section identifies all field-replaceable parts; the remainder of the section contains removal and replacement procedures for the field-replaceable parts.

6.2 Preventive Maintenance

Preventive maintenance is limited to cleaning the plastic case, keyboard and the display screen.

6.2.1 Cleaning the Computer

When it is necessary to clean the plastic case and keyboard use a soft, lint-free cloth, slightly dampened with a mild detergent solution or use the contents of any commercially available computer cleaning kit.

Caution: Never spray any liquids directly on the computer case, keyboard, or screen. If the liquid-crystal display (LCD) screen has become smeared or dusty, clean the screen first with a soft, clean, lint-free cloth and gently wipe the glass. If the glass is still smeared, use distilled water or a 25% solution of alcohol and distilled water.

Caution: Do not use paper towels to clean the display screen. Paper can scratch the display screen matte.

6.2.2 Handling the Computer

The notebook computer requires reasonable care and handling for extended life. Some of the precautions to follow to protect your computer against accidental damage include:

- Never pick up or carry the unit by the cover
- Do not force the cover beyond its fully opened position (about 180 degrees)
- Never subject the computer to harsh environments (dusty areas or areas of rapidly changing temperatures)
- Never place anything on top of the computer, particularly when it is operating or charging (could result in overheating and damage to the computer).
- Never move the computer while the hard drive is rotating (press the **Suspend** button to put the computer in a **Sleep** mode before closing cover).
- Never expose the computer hard disk drive(s) or disks to strong magnetic fields such as those generated by transformers, speakers, or telephone handsets.

6.2.3 Handling the Computer Battery Pack

The battery pack furnished with the computer requires reasonable care and handling to ensure efficient operation and maximum life. Periodically inspect the battery terminals and the batteries for evidence of corrosion and oxide build-up; clean if necessary.

To ensure that the battery packs endure normal life cycle, always observe the following precautions when handling the battery packs:

- Do not drop the battery pack or subject it to excessive shock and vibration.
- Do not expose the battery pack to direct sunlight, moisture, or chemical compounds.
- Do not disassemble the battery pack.
- Do not use the battery pack to power other devices.
- Do not short the battery leads or connect the battery with reversed polarity.
- Never attempt to charge the battery pack in any way other than as described in this manual.
- Always charge the battery pack as soon as possible after a low battery indication.

6.2.4 Password Caution

The notebook computer can be password protected to prevent unauthorized use. However, if the password is lost, the notebook must be returned to the Texas Instruments manufacturing facility in Temple, Texas U.S.A. to restore access. This service is not covered by warranty.

6.3 Required Tools and Equipment

All Extensa Notebook corrective maintenance procedures can be performed using the following tools:

- ♦ Tweezers
- ♦ Plastic Stick
- ♦ Small flat-blade screwdriver
- ♦ Small Phillips® screwdriver
- ♦ 5 mm Nut Driver

Caution: All boards, options and peripherals contain components that are sensitive to static electricity. When handling any of these items, protect against static electricity by using wrist grounding straps and grounded working mats. When moving or storing items, use the anti-static bags supplied with the items.

6.4 Notebook FRUs

Table 6-1 lists and describes the various FRUs for the Extensa 990 Series. As shown in Figure 6-1, all members of the Extensa 900 Series Notebook Computers contain two major assemblies:

- ♦ Notebook Assembly
  - Cover-Display Assembly
  - Base Assembly
- ♦ Mobile Productivity Base Assembly

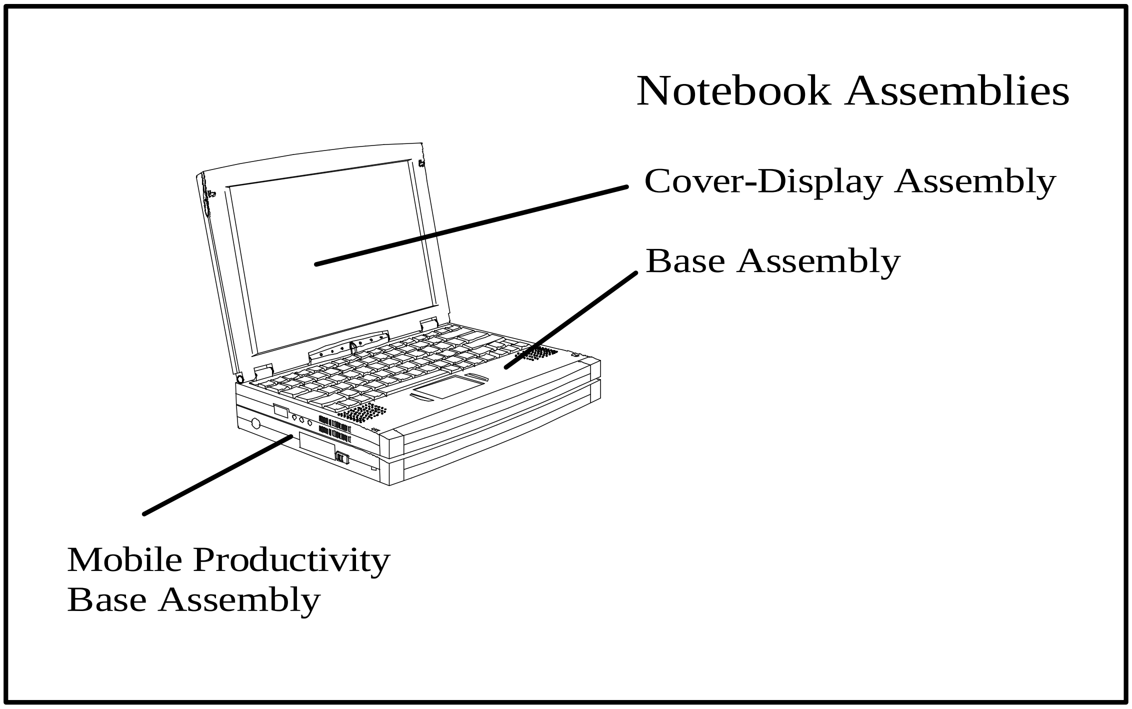


Figure 6-1 Extensa 900 Series Assemblies

6.4.1 Cover-Display Assembly

The Cover-Display Assembly shown in Figure 6-2, contains the LCD screen, DC-AC Inverter Board, DC-DC Inverter Board, bezel LCD cover and various other components as listed in Table 6-1.

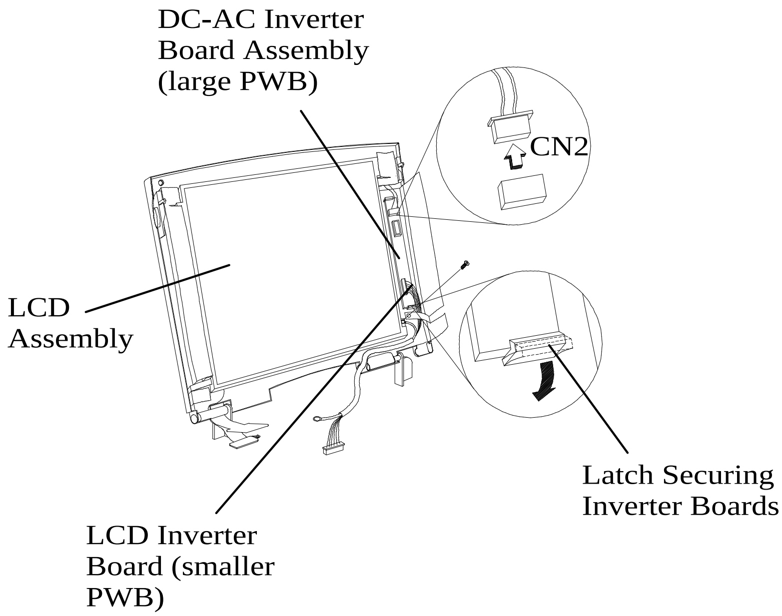


Figure 6-2 Display FRUs

Table 6-1 Top Cover Assembly Field-Replaceable Units (FRUs)

FRU Description	Assembly/ Disassembly Paragraph	TI Part No.
PWB INVERTER, DSTN, EXT. 90X	6.5.19	9813635-0001
BEZEL, DISPLAY DSTN 12.1", EXT. 90X	6.5.17	9813636-0001
LCD PANEL, DSTN, 12.1",SHARP, EXT. 90X	6.5.18	9813637-0001
DISPLAY ASSY. DSTN, 12.1", SHARP, EXT. 90X	6.5.7	9813638-0001
CABLE, DISPLAY, DSTN, FJ, EXT. 90X	6.5.7	9813678-0001
PWB INVERTER, TFT, EXT. 90X	6.5.19	9813639-0001
BEZEL, DISPLAY TFT, FJ, EXT. 90X	6.5.17	9813640-0001
LCD PANEL, TFT, 11.3", FJ, EXT. 90X	6.5.18	9813641-0001
DISPLAY ASSY, TFT, 11.3", SHARP, EXT. 90X	6.5.7	9813642-0001
CABLE, INVERTER WIRE 12P, EXT. 900	6.5.19	9813680-0001

6.4.2 System Base Assembly

As shown in Figure 6-3, the System Base Assembly houses a variety of field-replaceable subassemblies and components. The various assemblies and reference paragraph numbers containing removal/replacement procedures are listed in Table 6-2.

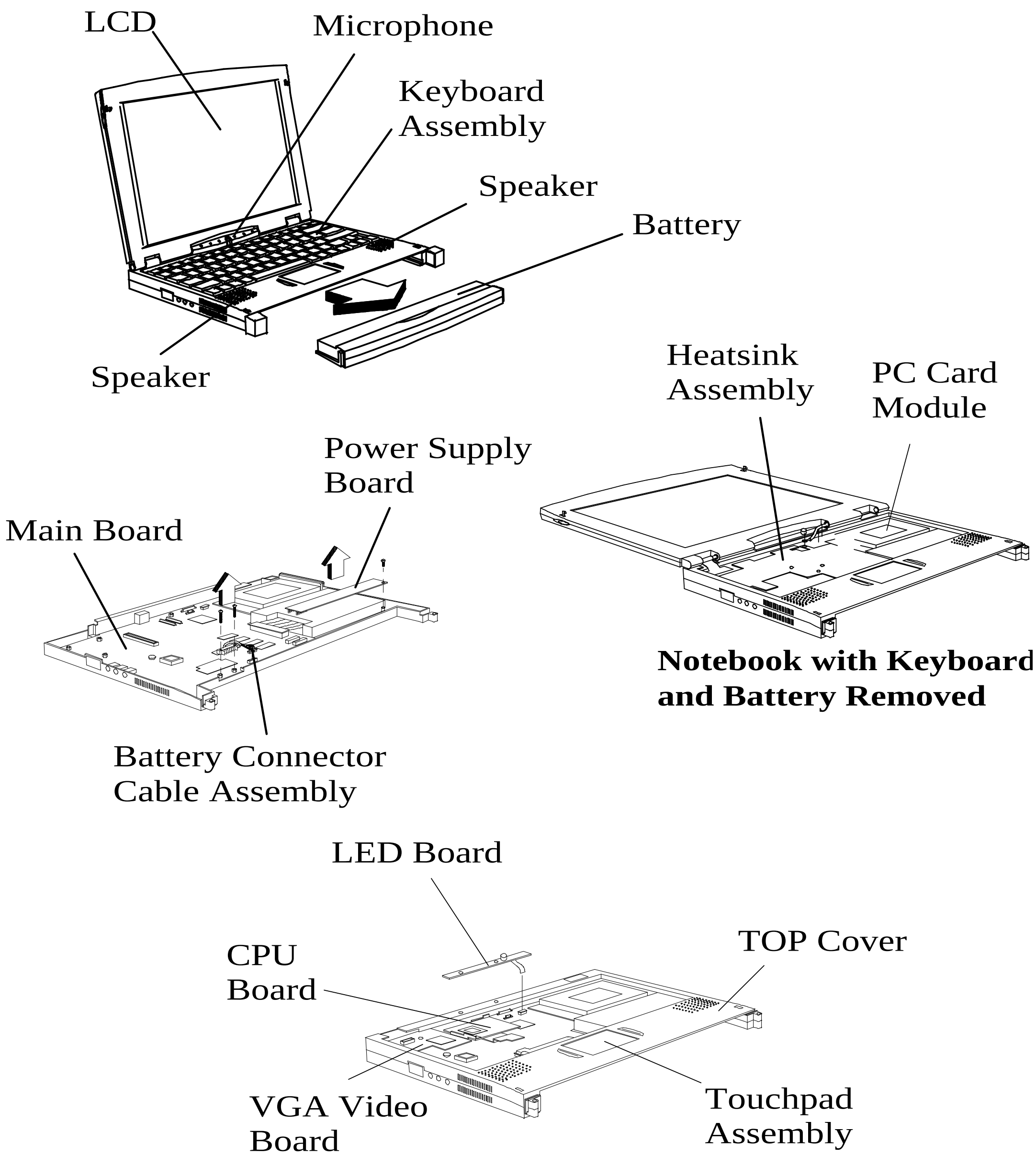


Figure 6-3 Notebook Base Assembly Major FRUs

Table 6-2 Base Assembly Field-Replaceable Units (FRUs)

Base Assembly FRU Description	Assembly/ Disassembly Paragraph	TI Part No.
PWB Assemblies		
PWB ASSY, MAIN BOARD W/O CPU, EXT. 90X	6.5.15	9813651-0001
PWB ASSY, VGA BOARD, EXT.90 X	6.5.11	9813652-0001
PWB ASSY, LED BOARD, EXT. 90X	6.5.8	9813653-0001
PWB ASSY, CPU BOARD, EXT. 90X	6.5.9	9813654-0001
PWB ASSY, DC-IN BOARD, EXT. 90X	6.5.13	9813655-0001
PWB ASSY, BATTERY BOARD, EXT. 90X	6.5.12	9813656-0001
PWB, POWER SUPPLY, EXT. 90X	6.5.12	9813643-0001
Keyboards		
KEYBOARD, US, EXT. 90X	6.5.5	9813648-0001
KEYBOARD, UK, EXT. 900	6.5.5	9813648-0002
KEYBOARD, GER, EXT .900	6.5.5	9813648-0003
KEYBOARD, FRA, EXT. 900	6.5.5	9813648-0004
KEYBOARD, SPA, EXT. 900	6.5.5	9813648-0005
KEYBOARD, SWI/GER/FRA, EXT. 900	6.5.5	9813648-0006
KEYBOARD, ITA, EXT. 900	6.5.5	9813648-0007
KEYBOARD, POR, EXT. 900	6.5.5	9813648-0008
KEYBOARDS, SWE, EXT. 900	6.5.5	9813648-0010
KEYBOARD, DEN, EXT. 900	6.5.5	9813648-0012
KEYBOARD, NOR, EXT. 900	6.5.5	9813648-0013
KEYBOARD, FIN, EXT. 900	6.5.5	9813648-0014
KEYBOARD, BEL, EXT. 900	6.5.5	9813648-0015
KEYBOARD, CHI, EXT. 900	6.5.5	9813648-0019
KEYBOARD, KOR, EXT. 900	6.5.5	9813648-0020
Peripherals/Cables		
HDD, 1.4GB, IBM, EXT.90X	6.5.4	9813645-0001
CABLE, FLEX, HDD, EXT.90X	6.5.4	9813644-0001
TOUCHPAD	6.5.16	9813516-0001
CABLE ASSY., TOUCHPAD, EXT. 90X	6.5.16	9813679-0001

Table 6-2 Base Assembly Field-Replaceable Units (FRUs)

Base Assembly FRU Description	Assembly/ Disassembly Paragraph	TI Part No.
FDD, EXT. 90X	Ref	9813649-0001
HDD BRACKET ASSY, EXT. 900	6.5.4	9813683-0001
Other Major Assemblies		
CASE, UPPER, EXT. 90X	6.5.10	9813646-0001
CASE, LOWER, EXT. 90X	6.5.10	9813647-0001
BATTERY, LI-ION, EXT. 90X	6.5.1	9813633-0001
HEAT SINK, MAIN, EXT. 900	6.5.6	9813685-0001
AC ADAPTER, 45W, ADP-45HP, EXT. 6XX	Ref	9813497-0004
PCMCIA MODULE, EXT. 900	6.5.14	9813716-0001
Service Manual	Ref	9813715-0001
Dummy Battery (case only) EXT. 90X	6.5.1	9813717-0001
Doors, Access Covers, misc		
COVER MEMORY, EXT. 900	2.3.1	9813663-0001
BRACKET HINGE, EXT. 900	Ref	9813664-0001
SPRING, EXT. SWP, EXT 900' SPG EXT SWP 0.2*2.0*17	Ref	9813665-0001
HINGE, RIGHT, EXT. 900	Ref	9813666-0001
HINGE, LEFT, EXT. 900	Ref	9813667-0001
KNOB BATTERY, EXT. 900	Ref	9813668-0001
COVER, HDD, EXT. 900	Ref	9813669-0001
TUBE FOR LCD ABS 072 EXT. 900	Ref	9813674-0001
BATTERY LOCK, RIGHT, EXT. 900	Ref	9813675-0001
BATTERY LOCK LEFT, EXT. 900	Ref	9813676-0001
DOOR SLIDE PC+FB 082 EXT. 900	Ref	9813677-0001
ASSY CORE UPPER CASE, EXT. 900	Ref	9813681-0001
HEAT PLATE ASSY., EXT. 900	6.5.6	9813682-0001
COVER, KEYBOARD, EXT. 900	6.5.5	9813684-0001
HOLDER ,TOUCHPAD, EXT.900	6.5.16	9813686-0001
SPRING LCD LOCK WPS EXT.900	Ref	9813687-0001
HOLDER DOCK CONNECTOR , EXT. 900	Ref	9813688-0001
RUBBER FOOT CR EXT.900	Ref	9813689-0001

Table 6-2 Base Assembly Field-Replaceable Units (FRUs)

Base Assembly FRU Description	Assembly/ Disassembly Paragraph	TI Part No.
TOUCHPAD, GND PLATE, EXT. 900	6.5.16	9813690-0001
CABLE, FLEX, LED BOARD, EXT. 90X	6.5.8	9813691-0001

6.4.3 Mobile Productivity Base Assembly

The FRU list for the MPB is provided in Table 6-3. The major MPB FRUs are identified in Figure 6-4.

Table 6-3 Mobile Productivity Base FRUs

FRU Description	Assembly/ Disassembly Paragraph	TI Part No.
PWB ASSY, CHARGER BOARD, MPB, EXT. 90X	Ref	9813657-0001
CASE, BOTTOM, MPB, EXT. 90X	Ref	9813658-0001
PWB ASSY, MAIN BOARD, MPB, EXT. 90X	6.6.7	9813661-0001
PWB ASSY, DC-IN BOARD, MPB, EXT. 90X	6.6.6	9813662-0001
PWB ASSY, BATTERY BOARD, EXT. 900 (same as used in Notebook)	Ref	9813656-0001
CASE, UPPER, MPB, EXT. 90X	Ref	9813659-0001
CABLE ASSY, DOC, MPB, EXT. 90X	Ref	9813660-0001
KNOB HAND LEVER LOCK, MPB, EXT. 900	Ref	9813670-0001
KNOB, MODULE LATCH, MPB, EXT. 900	Ref	9813671-0001
LOCK HAND LEVER, MPB, EXT. 900	Ref	9813672-0001
LATCH MODULE, MPB, EXT. 900	Ref	9813673-0001
CD-ROM DRIVE, EXT. 90X	6.6.1	9813650-0001

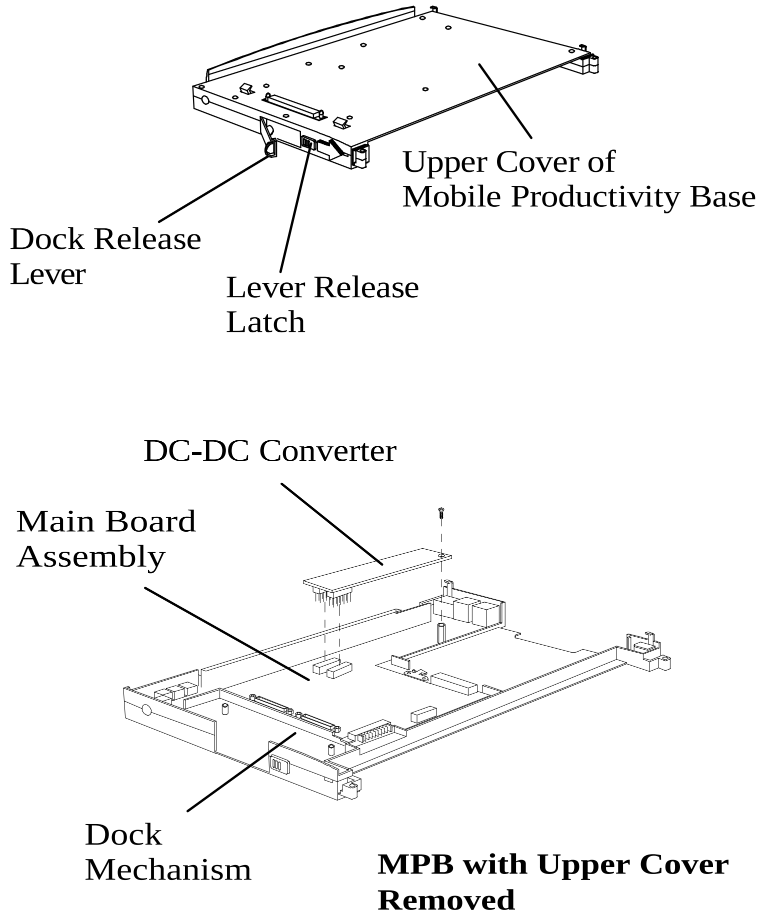


Figure 6-4 Mobile Productivity Base Major FRUs

6.5 Notebook FRU Replacement Procedures

The following paragraphs contain field service-level removal/replacement procedures for the 900 Series Notebook Computers.

Most FRU removal/replacement procedures involve connecting and disconnecting cable connectors. The Extensa series uses two types of connectors including:

- ♦ Locking-type connectors - Use a plastic stick to unlock and lock these type of connectors as shown in Figure 6-5.
- ♦ Non-locking connectors

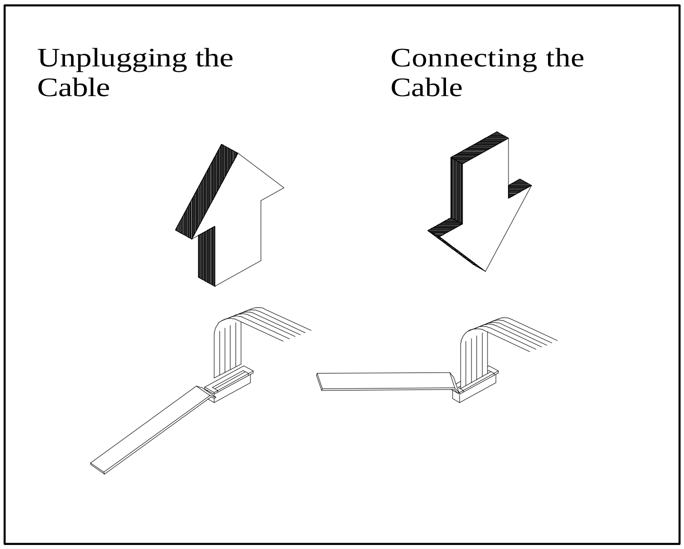


Figure 6-5 Removing/Installing Cables with Locking-Type Connectors

6.5.1 Removing/Replacing the Notebook Battery Pack

Before performing any of the assembly/disassembly procedures, **always** disconnect the AC adapter from the notebook and remove all battery packs. The procedure for removing and replacing the notebook battery pack is as follows:

1. Turn off the computer and disconnect the AC adapter from the computer.
2. Unlock the battery on each side of the notebook and pull the battery out of the front of the notebook as shown in Figure 6-6.
3. Replacement is essentially the reverse of Steps 1 and 2 (connector side of battery goes up).

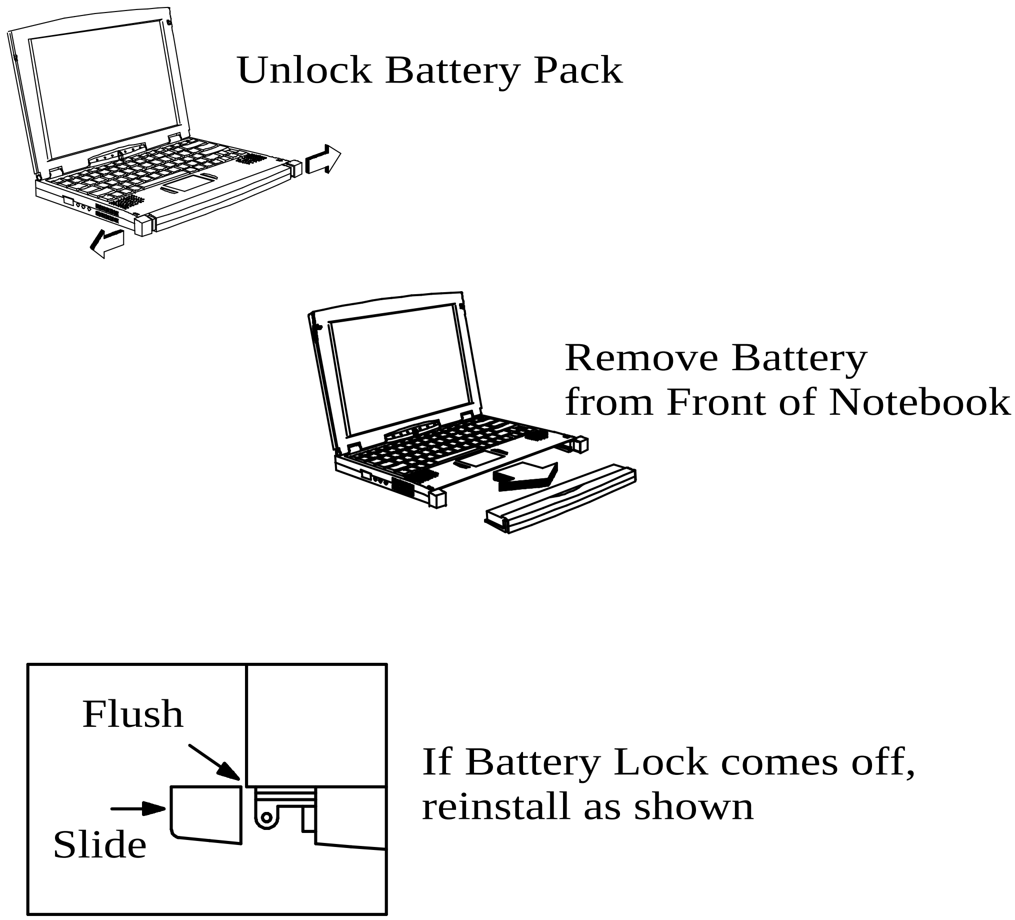


Figure 6-6 Notebook Battery Removal/Replacement

6.5.2 Removing/Replacing PCMCIA Options

The procedure for removing and replacing the PCMCIA options is as follows:

1. Turn off the computer and remove the battery pack(s) as described in Paragraph 6.5.1.
2. Press the upper card eject button to eject the upper card, lower button controls the lower card and use both buttons for Type III devices.
3. To replace the PCMCIA device, remove any filler cards present and insert the device. Reinstall any external cabling required for the device.

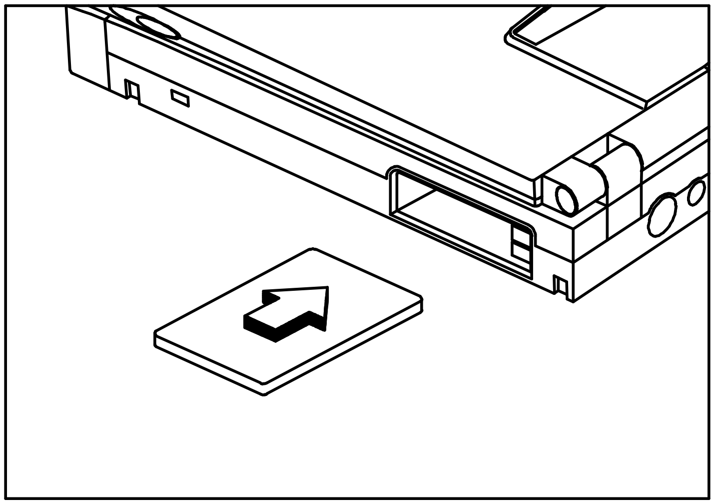
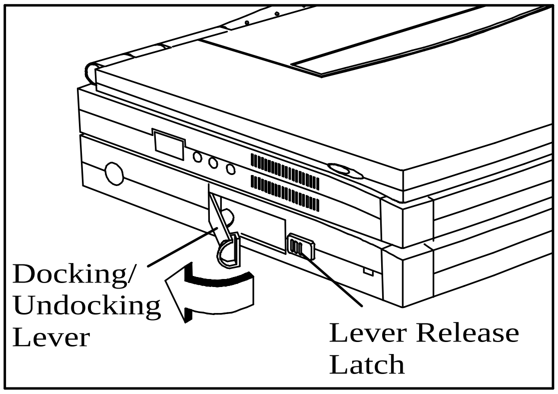


Figure 6-7 Installing/Removing PCMCIA Options

6.5.3 Installing/Removing the Mobile Productivity Base

The procedure for removing and replacing the Mobile Productivity Base assembly is as follows:

1. Power down the notebook and disconnect the AC adapter if installed.
2. Slide the lever release latch to the front of the MPB to release the docking lever (refer to Figure 6-8).
3. Swing the Docking Lever outward a full 90 degrees from the side of the MPB.



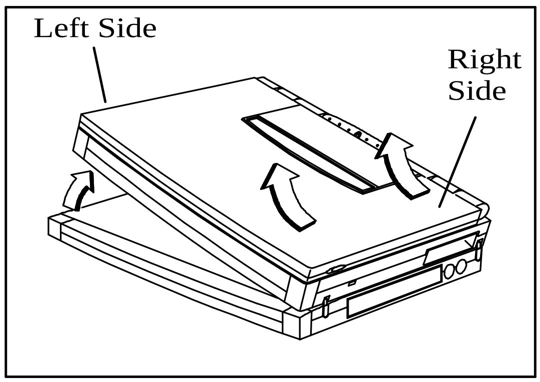


Figure 6-8 Removing/Replacing the MPB

4. The swing lever also pushes the computer up slightly off the MPB allowing you to grasp the computer on the left hand side.
5. Lift the computer up slightly on the left hand side. Hold the computer securely on both ends and pull the computer out of the MPB, left side first as shown in Figure 6-8
6. Close the lever and close the expansion door on the bottom of the computer.
7. To replace the notebook in the MPB, turn the notebook over and open the expansion door (slide the door toward the center of the notebook).
8. Slide the Release latch toward the front of the MPB to release the lever; then swing the lever completely away from the MPB until the lever is 90 degrees open from the side of the MPB.

9. Slide the computer into the MPB, right side first, ernsuring that the guides on both the computer and the docking base are securely hooked; then rest the computer on the base.

10. Press and hold down the computer; then swing the lever toward the MPB until the latch release locks the computer in place.

6.5.4 Removing/Replacing the Hard Disk Drive Assembly

The procedure for removing and replacing the Hard Disk Drive assembly is as follows:

1. Power down the notebook, disconnect the AC adapter, if installed, and remove the battery pack as described in Paragraphs 6.5.1 and 6.5.2.

2. Disconnect the Mobile Productivity Base and any installed PCMCIA options.

3. Turn the computer over and remove the hard disk drive bay cover (refer to Figure 6-9).

4. Grasp the drive loop and remove the drive from the notebook.

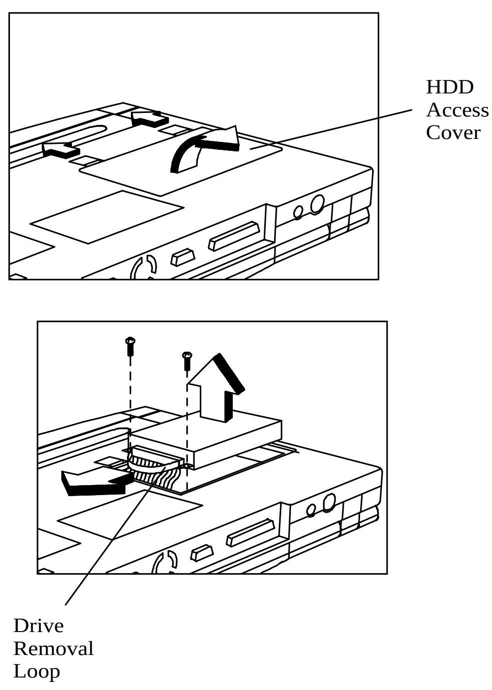


Figure 6-9 Removing/Replacing the Hard Disk Drive Module

5. Store the HDD in an antistatic bag.

6. Replacement is the reverse of Steps 1 through 5.

6.5.5 Removing/Replacing the Keyboard Assembly

The procedure for removing and replacing the keyboard assembly is as follows:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Remove the four screws near the display hinges (rear of the notebook) as shown in Figure 6-10.

3. Snap out and pull up the Status Panel (refer to Figure 6-10).

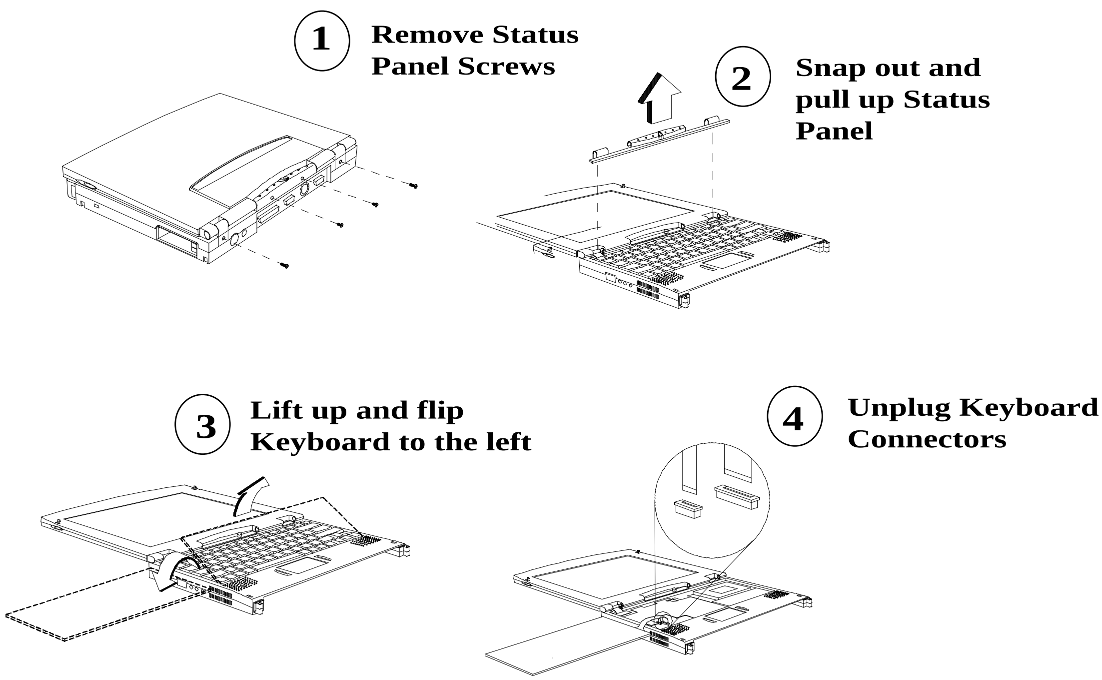


Figure 6-10 Removing the Keyboard Assembly

4. Lift up the Keyboard Assembly to free it from the notebook and then flip the keyboard to the left side of the notebook as shown in Figure 6-10.

5. Unplug the keyboard connectors (CN5 and CN14) and set aside the Keyboard Assembly.
6. Replacement is essentially the reverse of Steps 1 through 5.

6.5.6 Heat Sink Assembly Removal/Replacement

To remove and replace the Heat Sink Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.
3. Remove the four screws securing the Heat Sink Assembly to the notebook and remove the heat sink.
4. Replacement of the Heat Sink Assembly is the reverse of Steps 1 through 3.

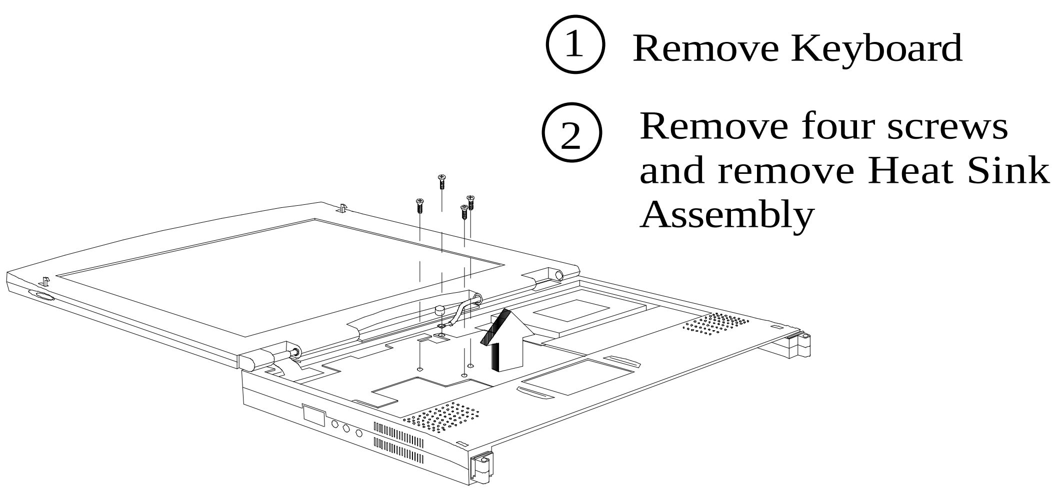


Figure 6-11 Heat Sink Assembly Removal/Replacement

6.5.7 Display Assembly Removal/Replacement

To remove and replace the Display Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.

3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.

4. Refer to Figure 6-12 and remove the two rear screws that secure the Display to the notebook housing. **Note:** You don't have to remove the leftmost screw.

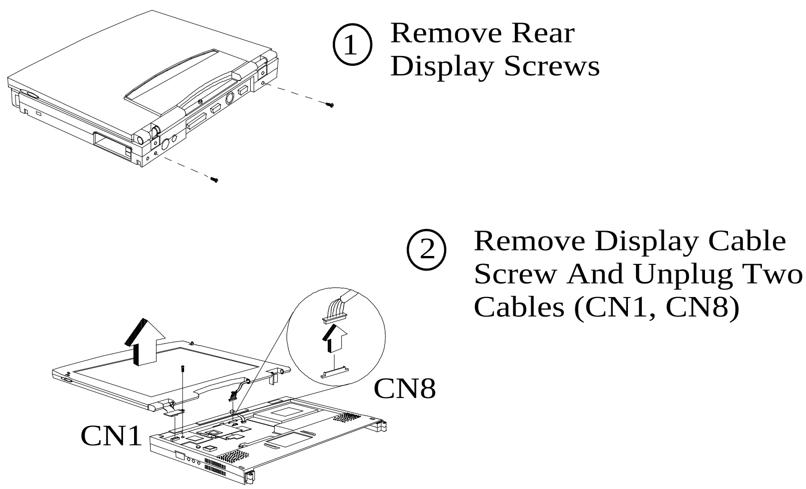


Figure 6-12 Removing/Replacing the Display Assembly

5. Remove the screw securing the Display Cable to the Main Board and unplug the Display Cable (CN1) and the Inverter Cable (CN8).

6. Remove the Display Assembly from the Base Assembly.

7. Replacement is the reverse of Steps 1 through 6.

6.5.8 Removing/Replacing the LED/Microphone Board Assembly

To remove and replace the LED Board Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.

3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.

4. Remove the Display Assembly as described in Paragraph 6.5.7.

5. Remove the two screws that secure the LED Board Assembly and unplug cable connector CN7; remove the LED Board Assembly.

6. Replacement is the reverse of Steps 1 through 5.

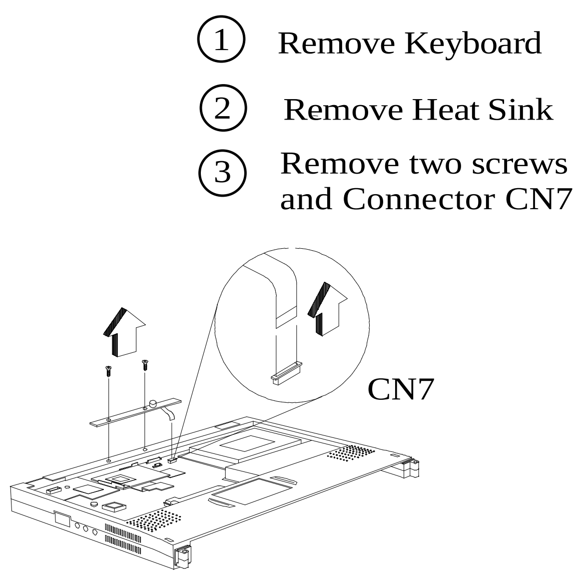


Figure 6-13 Removing/Replacing the LED/Microphone Board Assembly

6.5.9 Removing/Replacing the CPU Board

To remove and replace the CPU Board Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.
3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.
4. Remove the screw securing the CPU Board to the Main Board and pull up to remove the board from connector J1.
5. Replacement is the reverse of Steps 1 through 4.

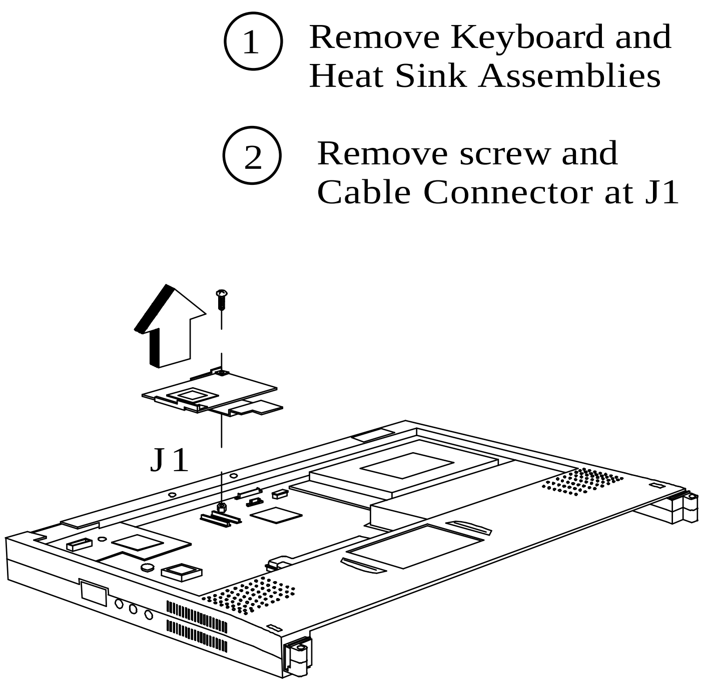


Figure 6-14 CPU Board Assembly Removal/Replacement

6.5.10 Removing/Replacing the Top Cover

To remove and replace the Top Cover Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.
3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.
4. Remove the Display Assembly as described in Paragraph 6.5.7.
5. Remove four screws from the bottom of the base assembly.
6. Turn the base assembly over and remove Touchpad/Speaker connector CN19.
7. Remove four screws from the four corners of the top cover (Figure 6-14).
8. Beginning from the left side of the unit, unsnap the top cover from the base assembly.
9. Replacement is the reverse of Steps 1 through 8.

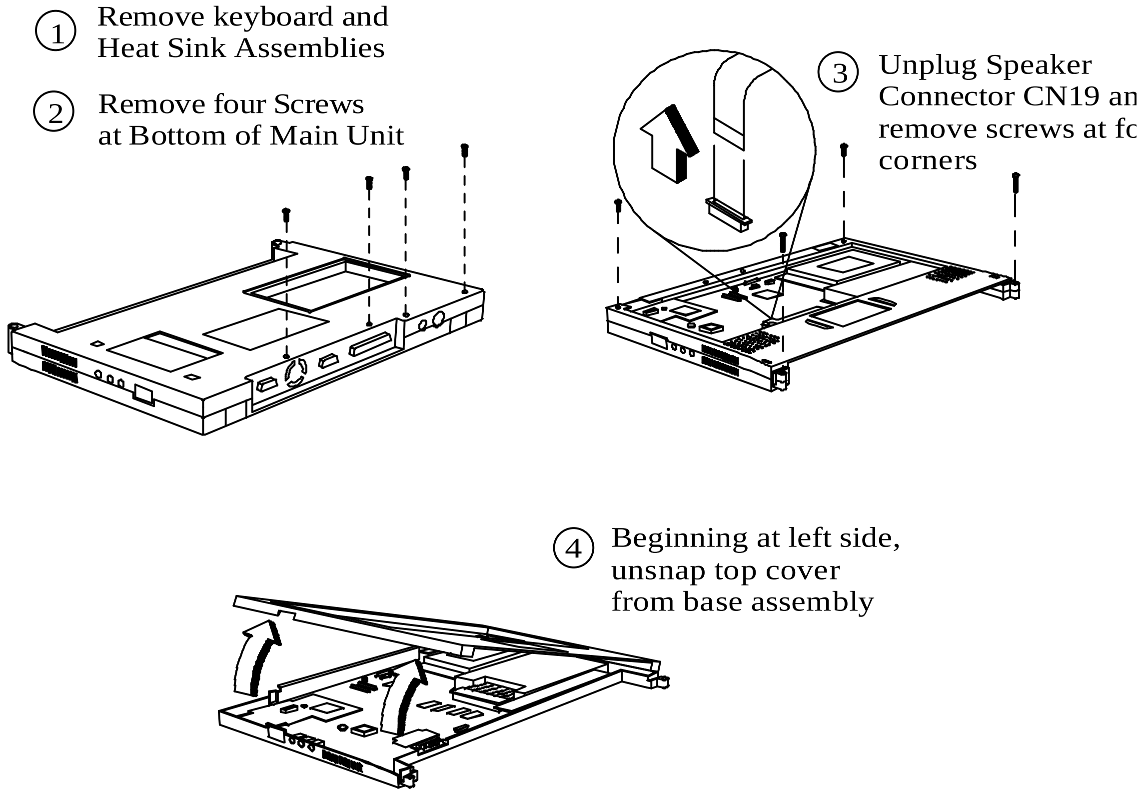


Figure 6-15 Removing/Replacing the Top Cover

6.5.11 Removing/Replacing the VGA Video Board

To remove and replace the VGA Video Board Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.

3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.

4. Remove the Display Assembly as described in Paragraph 6.5.7.

5. Remove two screws and unplug the VGA Video Board from the Main Board as shown in Figure 6-16.

6. Replacement is the reverse of Steps 1 through 5.

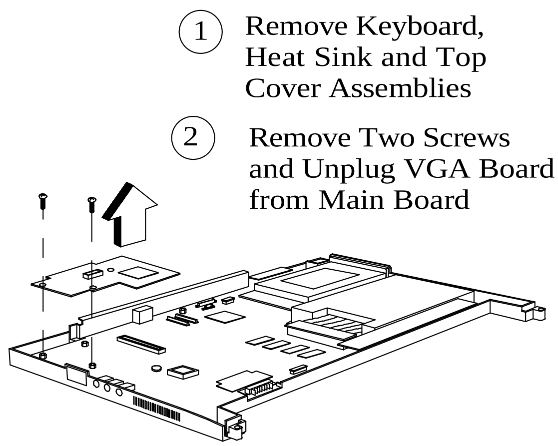


Figure 6-16 Removing/Replacing the VGA Video Board Assembly

6.5.12 Removing/Replacing the Power Supply Board

To remove and replace the Power Supply Board Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.

3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.

4. Remove the screw that secures the Power Supply Board Assembly to the Main Board and remove the board from the base assembly.

5. Replacement is the reverse of Steps 1 through 4.

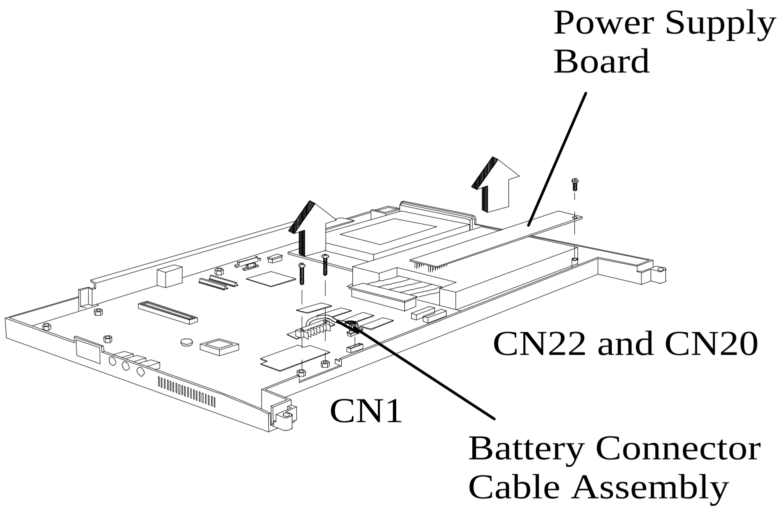


Figure 6-17 Removing/Replacing the VGA Video Board Assembly

6.5.13 Removing/Replacing the DC-In Board Assembly

To remove and replace the DC-In Board Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.

3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.

4. Unplug cable connectors CN9 and CN10 and remove the board.

5. Replacement is the reverse of Steps 1 through 4.

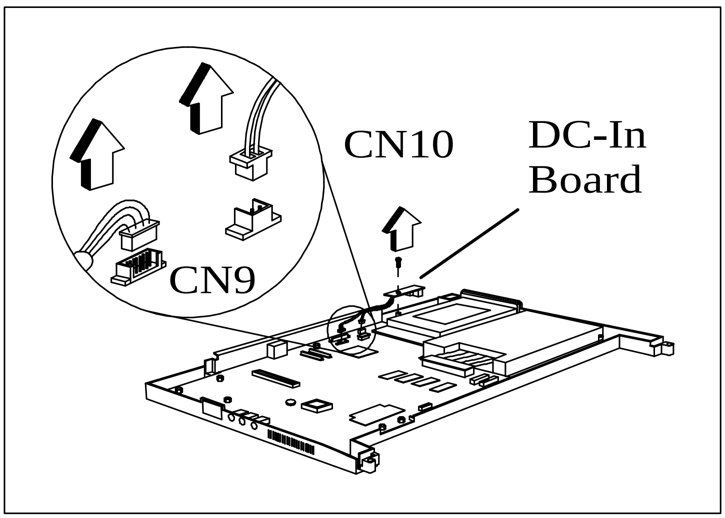


Figure 6-18 Removing/Replacing the DC-In Board Assembly

6.5.14 Removing/Replacing the PC Card Module

To remove and replace the PC Card Module Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.
3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.
4. Remove the Display Assembly as described in Paragraph 6.5.7.
5. Remove the four screws that secure the PC Card Module to the Main Board (refer to Figure 6-19).
6. Replacement is the reverse of Steps 1 through 5.

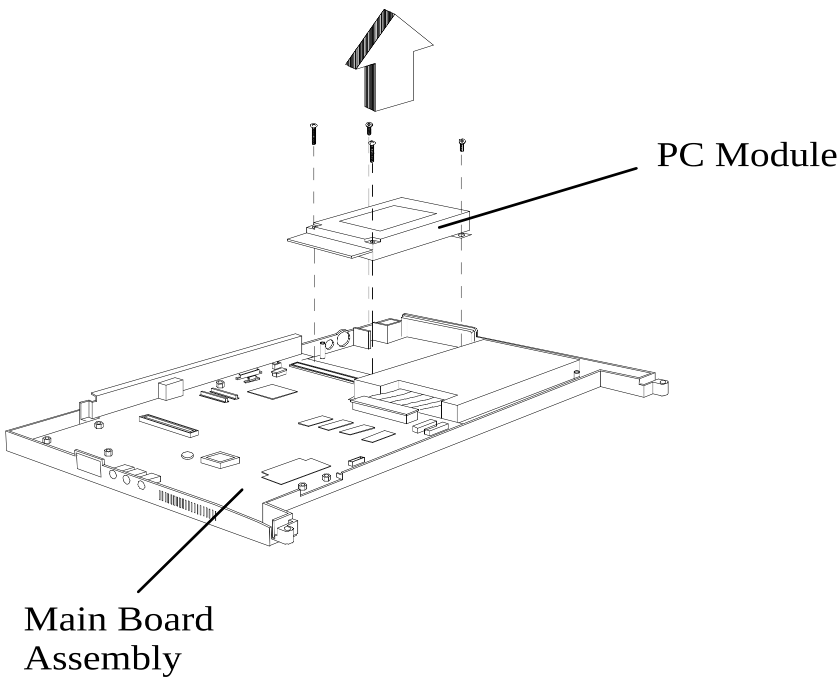


Figure 6-19 Removing/Replacing the PC Card Module

6.5.15 Removing/Replacing the Main Board Assembly

To remove and replace the Main Board Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.
3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.
4. Remove the Display Assembly as described in Paragraph 6.5.7.
5. Remove the Top Cover Assembly as described in Paragraph 6.5.10.
6. Remove fourteen screws from the bottom assembly as shown in Figure 6-20.
7. Remove the top cover as described in Paragraph 6.5.10.
8. Remove the Main Board Assembly.
9. Replacement is the reverse of Steps 1 through 8.

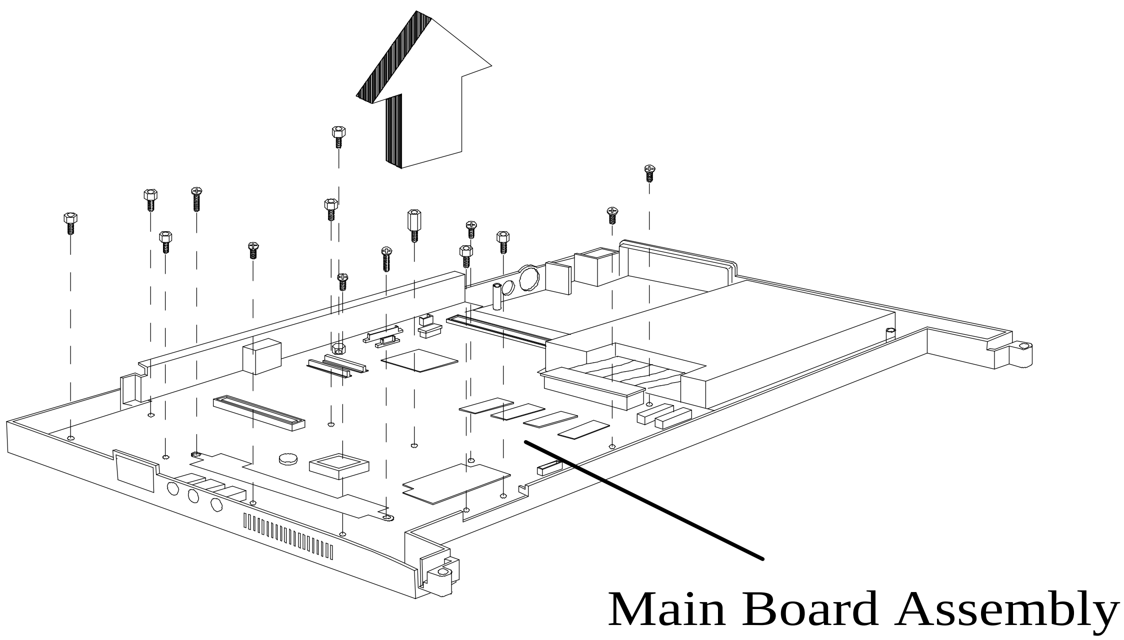


Figure 6-20 Removing/Replacing the Main Board Assembly

6.5.16 Removing Touchpad and Speakers

To remove and replace the Touchpad and Speakers, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Remove the Keyboard Assembly as described in Paragraph 6.5.5.
3. Remove the Heat Sink Assembly as described in Paragraph 6.5.6.
4. Remove the Display Assembly as described in Paragraph 6.5.7.
5. Remove the Top Cover Assembly as described in Paragraph 6.5.10.
6. Remove the connectors on both sides of the Touchpad Assembly and detach speakers from the top cover.
7. Remove the two screws that secure the Touchpad Assembly to the Top Cover and remove the Button Assembly, Metal Plate, and Touchpad Main Sensor as shown in Figure 6-21.
8. Replacement is the reverse of Steps 1-7.

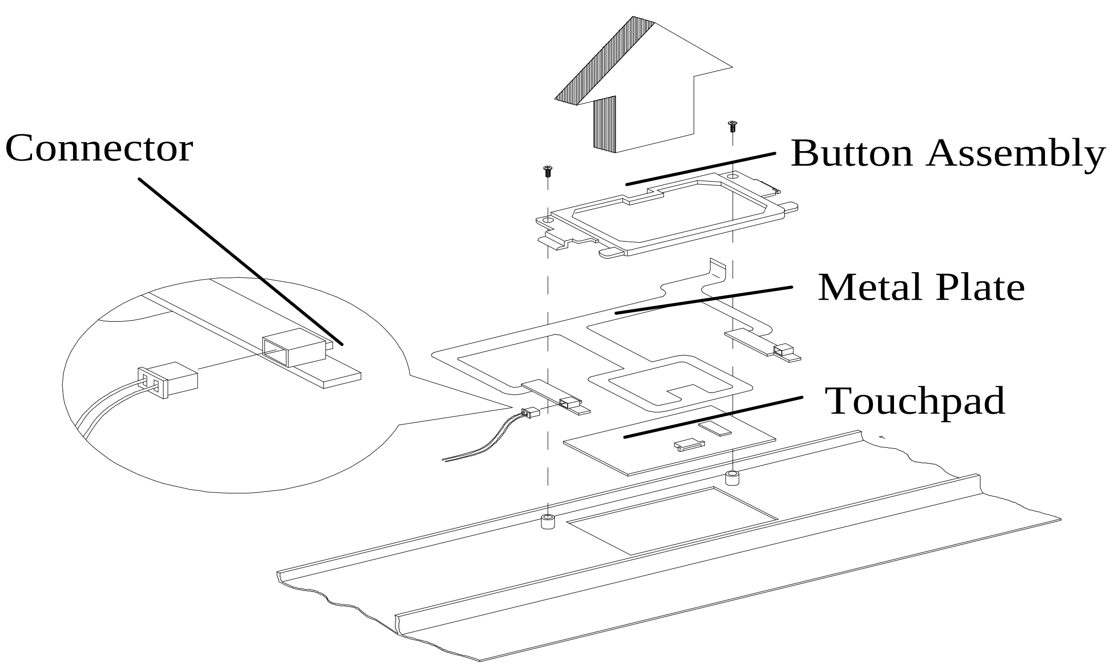


Figure 6-21 Removing Touchpad Assembly

6.5.17 Removing/Replacing the Display Bezel

To remove and replace the Display Bezel Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Use a sharp object to remove the six bezel screw covers and remove the six screws.
3. Pull out and remove the Display Bezel.
4. Replacement is the reverse of Steps 1 through 3.

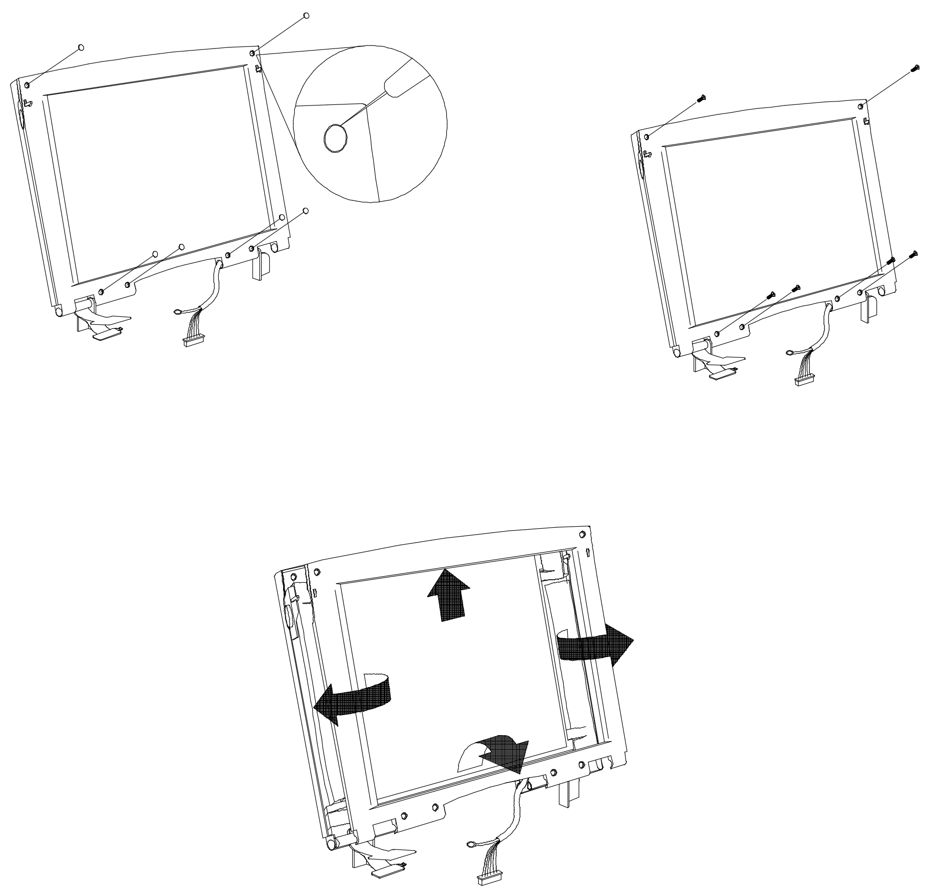


Figure 6-22 Removing/Replacing the Display Bezel

6.5.18 Removing/Replacing the LCD

To remove and replace the LCD, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Remove the Display Bezel as described in Paragraph 6.5.17.
3. Remove three screws securing the LCD Assembly and pull up on the LCD Panel (Figure 6-23).
4. Tilt the LCD Panel away from the display cover; unplug the LCD Panel from the Display Cable Assembly (Figure 6-23) and remove the LCD Assembly.
5. Replacement is the reverse of Steps 1 through 4.

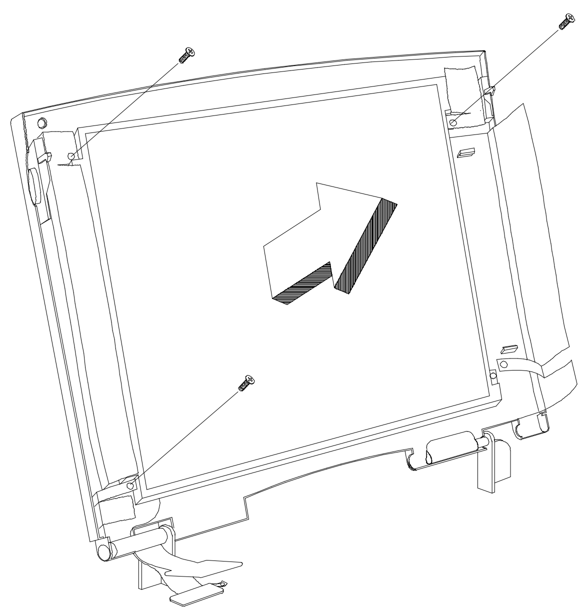


Figure 6-23 Removing/Replacing the LCD Assembly

6.5.19 Removing/Replacing the Display Inverter Boards

To remove and replace the Display Inverter Boards, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Remove the Display Bezel as described in Paragraph 6.5.17.

3. Gently fold back the foil around the display and unplug the inverter cable, CN2.

4. Next, remove the screw securing the DC-AC Inverter Board (larger of the two PWBs) and the LCD ID Board (smaller of the PWBs) to the display back cover.

5. Press down on the latch (refer to Figure 6-24) and remove the Inverter Boards.

6. Replacement is the reverse of Steps 1 through 5.

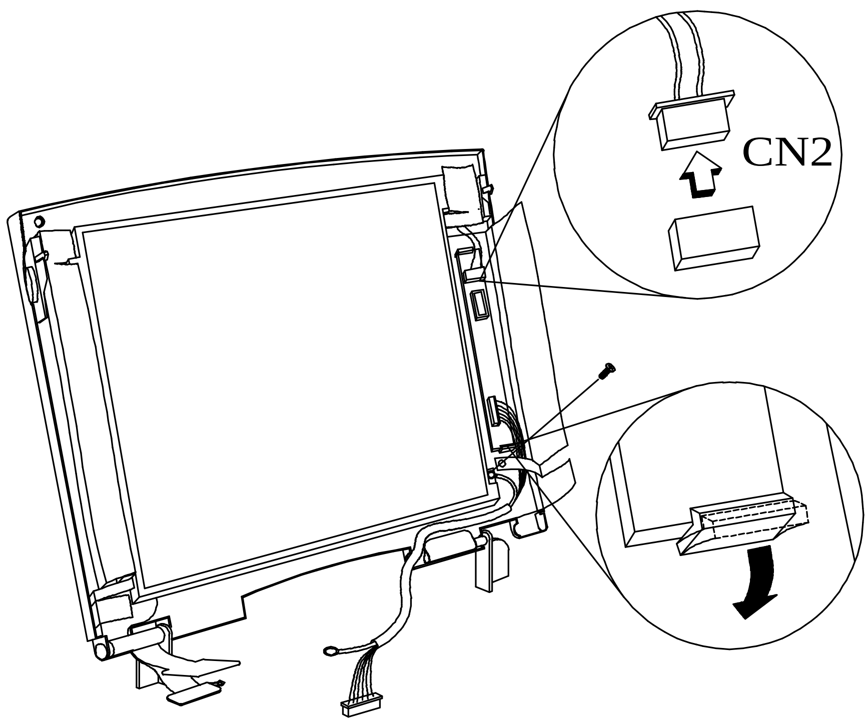


Figure 6-24 Removing/Replacing the Display Inverter Boards

6.6 Removing/Replacing MPB FRUs

6.6.1 Removing/Replacing the Media Bay Device

To remove and replace a MPB Modular Bay Device (e.g., CD-ROM Drive or Floppy Disk Drive), use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Unlatch the module by pressing the latch at the base of the MPB toward the unlock icon (rear of MPB) (refer to Figure 6-25).

3. Simultaneously, grasp the recessed grip area on the module and pull module out of the MPB.

4. Installation is the reverse of Steps 1 through 3.

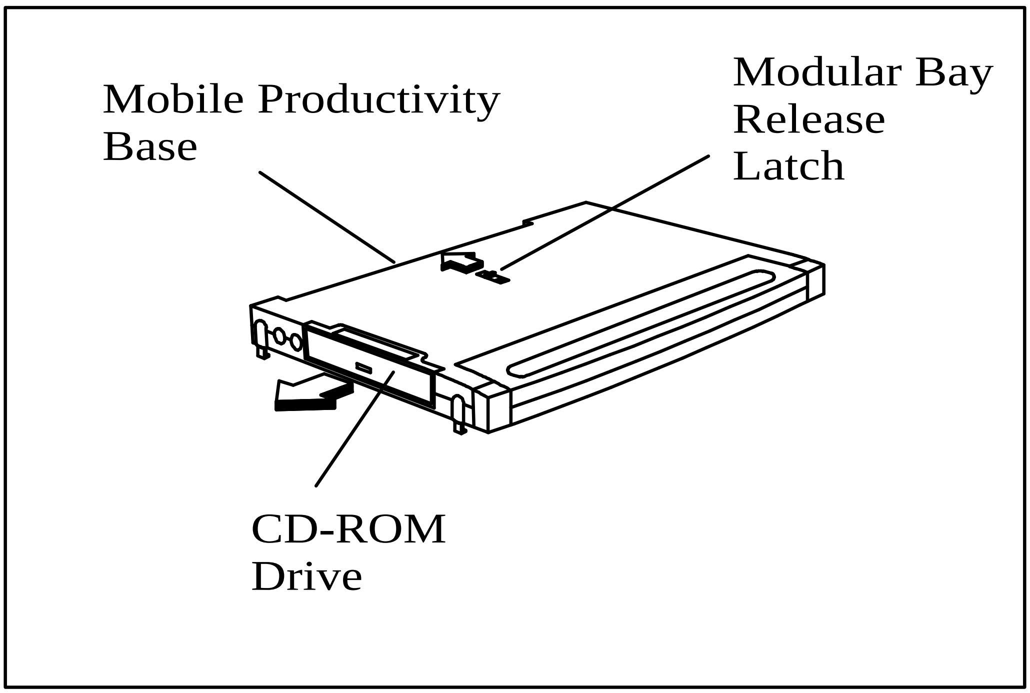


Figure 6-25 Installing/Removing Media Bay Devices

6.6.2 Removing/Replacing the MPB Battery

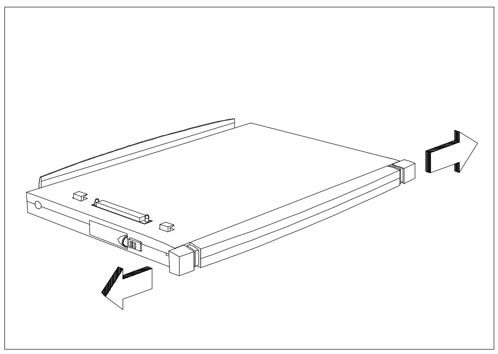
To remove and replace an MPB battery pack or dummy battery pack, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

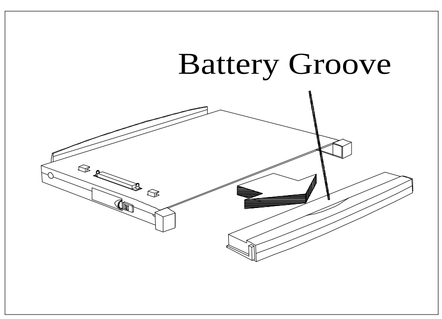
2. Using your thumbs, unlock the two battery locks at each side of the MPB (refer to Figure 6-26).

3. Pull the module out of the MPB.

4. Installation is the reverse of Steps 1 through 3.



Unlocking the Battery



Removing the Battery

Figure 6-26 Installing/Removing Battery Pack in MPB

6.6.3 Removing/Replacing the MPB Housing

To remove and replace the MPB housing, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Using your thumbs, unlock the two battery locks at each side of the MPB (refer to Figure 6-26).
3. Pull the module out of the MPB.
4. Slide the Lever Release Latch forward to release the Docking Lever; extend Docking Lever 90 degrees from the side of the MPB.
5. Remove fourteen screws from the top of the MPB as shown in Figure 6-27.
6. Lift up on the top section of the MPB Housing (from the left side as shown in Figure 6-27) then pull to remove the top section of the MPB.
7. Replacement is the reverse of Steps 1 through 6.

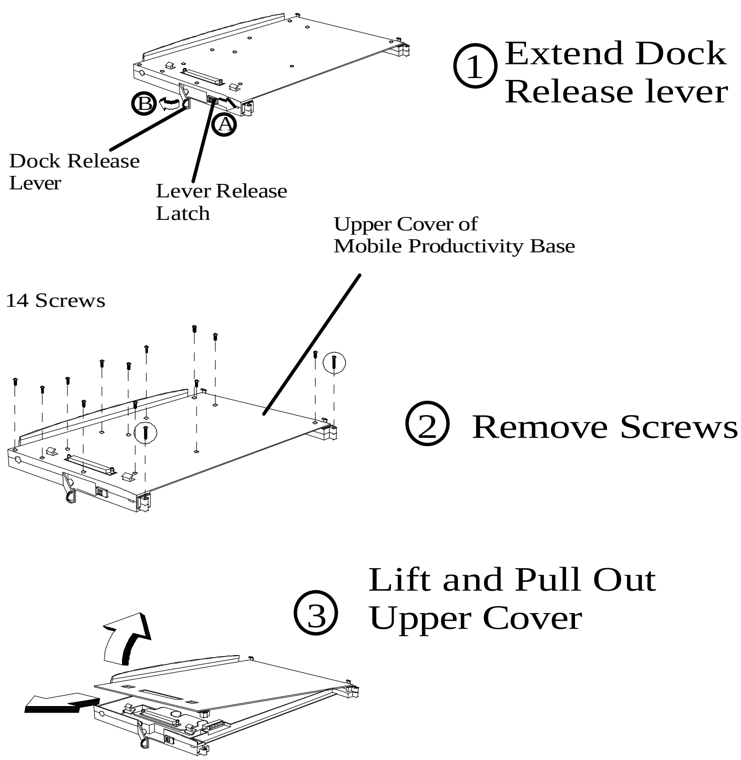
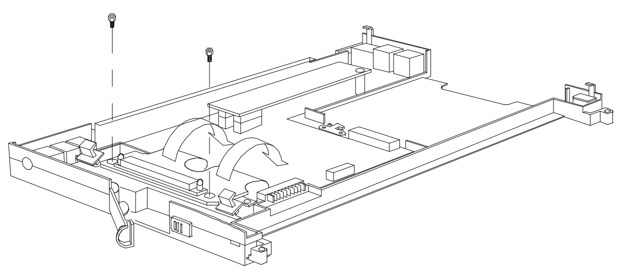


Figure 6-27 Removing/Replacing the MPB Housing

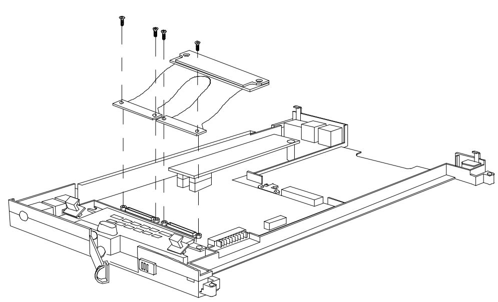
6.6.4 Removing/Replacing the Docking Cable

To remove and replace the MPB Docking Cable, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Using your thumbs, unlock the two battery locks at each side of the MPB (refer to Figure 6-26); pull the battery pack out of the MPB.
3. Remove the MPB Housing as described in Paragraph 6.6.3.
4. Remove two screws securing the Docking Cable to release the assembly (refer to Figure 6-28).
5. Remove the four screws securing the Docking Cable assembly to the Docking Mechanism and remove the Docking Cable.
6. Replacement is essentially the reverse of Steps 1 through 5.



Release Docking Cable



Remove Docking Cable Screws

Figure 6-28 Removing/Replacing the MPB Docking Cable

6.6.5 Removing/Replacing the Docking Mechanism

To remove and replace the MPB Docking Mechanism, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Using your thumbs, unlock the two battery locks at each side of the MPB (refer to Figure 6-26); pull the battery pack out of the MPB.

3. Remove the MPB Housing as described in Paragraph 6.6.3.

4. Remove the Docking Cable as described in Paragraph 6.6.4.

5. Remove the two screws that secure the Docking Mechanism to the bottom section of the housing and remove the Docking Mechanism.

6. Replacement is the reverse of Steps 1 through 5.

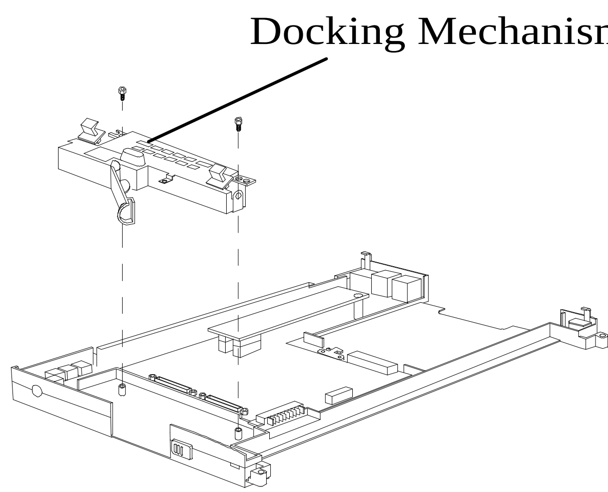


Figure 6-29 Removing/Replacing the Docking Mechanism

6.6.6 Removing/Replacing the MPB DC-DC Converter

To remove and replace the MPB DC-DC Converter Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.
2. Using your thumbs, unlock the two battery locks at each side of the MPB (refer to Figure 6-26); pull the battery pack out of the MPB.
3. Remove the MPB Housing as described in Paragraph 6.6.3.
4. Remove the screw that secures the DC-DC Converter to the bottom section of the MPB housing and remove the DC-DC-Converter.
5. Replacement is the reverse of Steps 1 through 4.

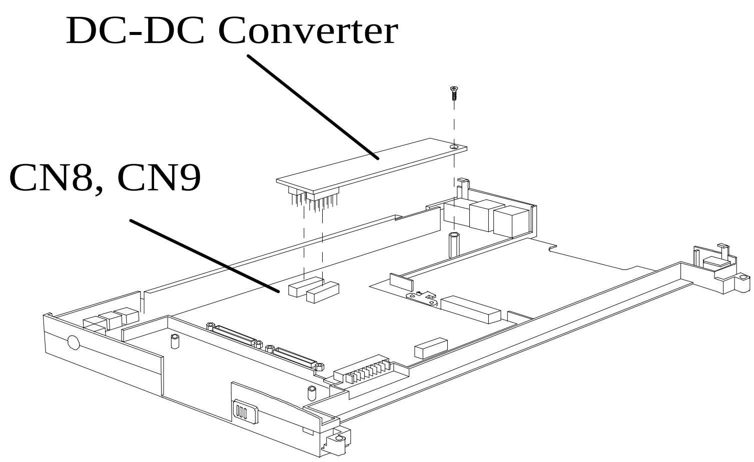


Figure 6-30 Removing/Replacing the MPB DC-DC Converter Board

6.6.7 Removing/Replacing the MPB Main Board Assembly

To remove and replace the MPB Main Board Assembly, use the following procedure:

1. Turn off the computer; disconnect the AC power adapter (if it is attached), and remove the battery pack and PCMCIA cards as described in Paragraphs 6.5.1 and 6.5.2. Also disconnect the MPB (Paragraph 6.5.3) if attached.

2. Using your thumbs, unlock the two battery locks at each side of the MPB (refer to Figure 6-26); pull the battery pack out of the MPB.

3. Remove the MPB Housing as described in Paragraph 6.6.3.

4. Remove the MPB Docking Cable and Docking Mechanism as described in Paragraphs 6.6.4 and 6.6.5.

5. Remove the screw that secures the DC-DC Converter to the bottom section of the MPB housing and remove the DC-DC-Converter.

6. Remove the DC-In and Battery Charger Cable Connectors (CN 13 and CN10).

7. Remove the 12 screws that secure the Main Board to the bottom section of the housing. Then pull up on the main board and remove it from the unit.

8. Replacement is the reverse of Steps 1 through 7.

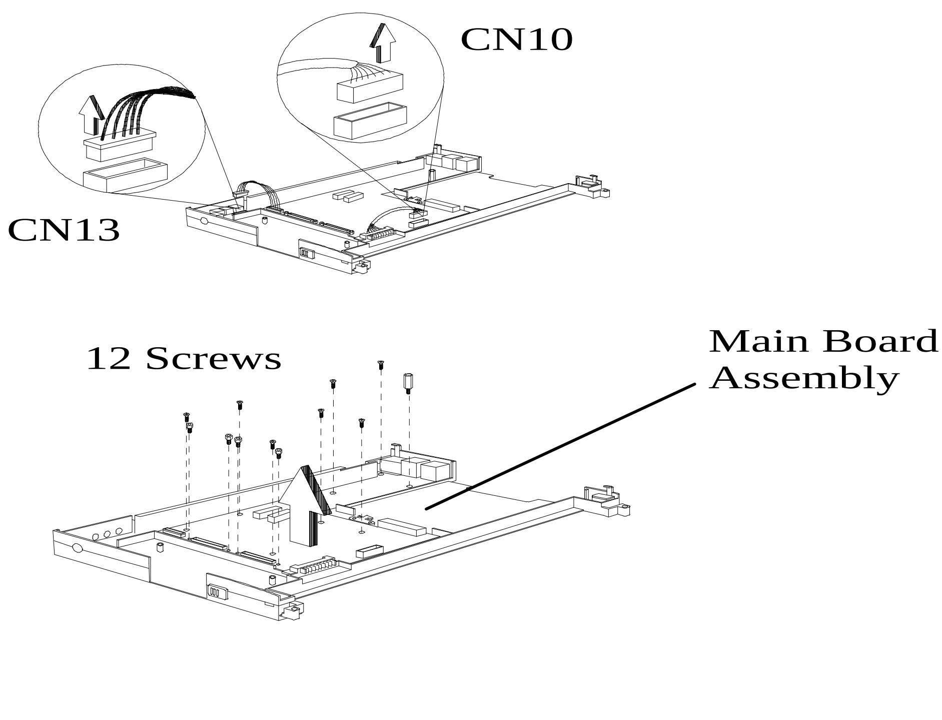


Figure 6-31 Removing/Replacing the MPB Main Board Assembly

A
Notebook Schematic Diagrams

A.1 Introduction

This section contains schematic diagrams for the Extensa 900 Series Notebook Computer. Logic schematics for the Mobile Productivity Base are provided in Appendix B of this manual.

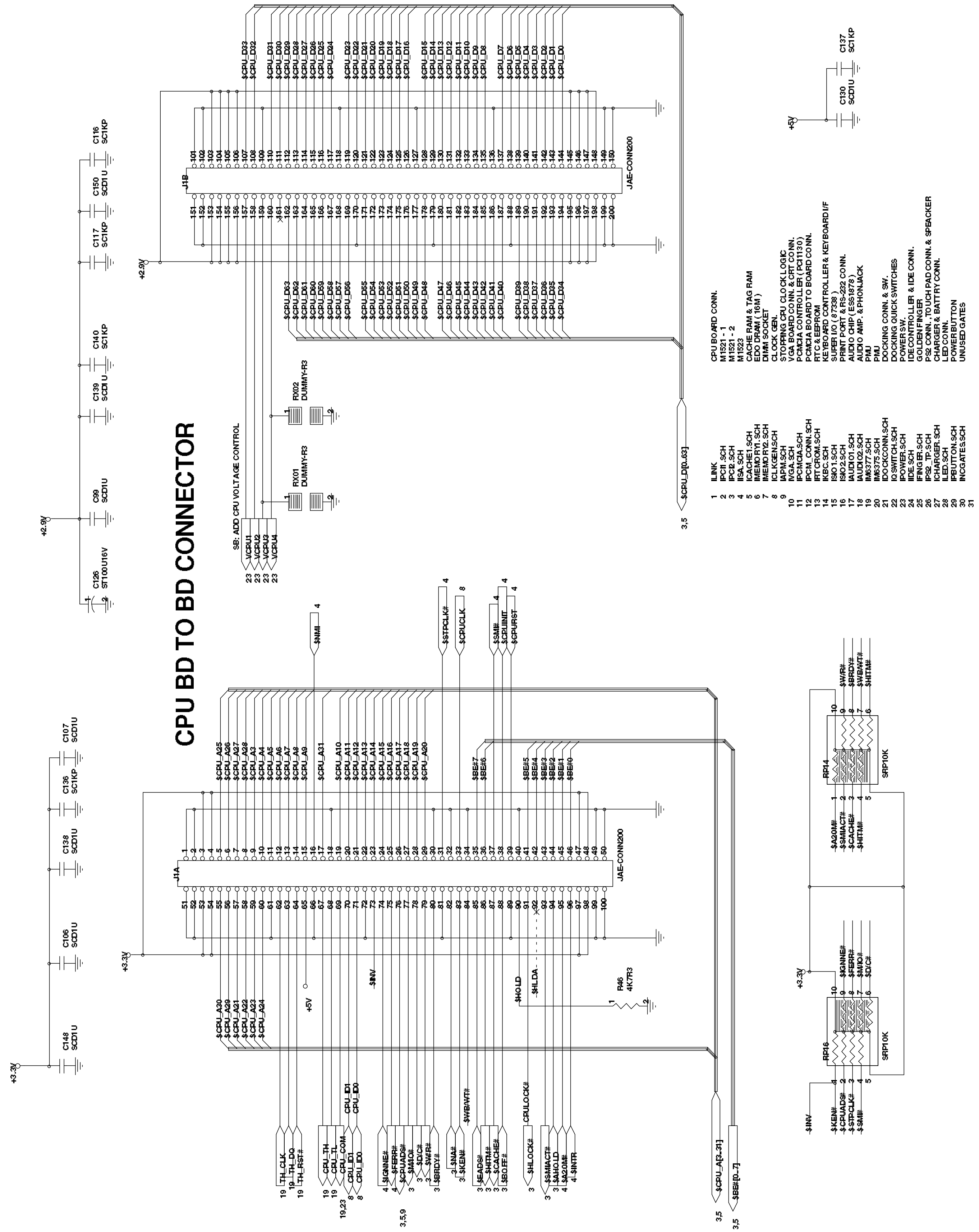


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 1 of 30)

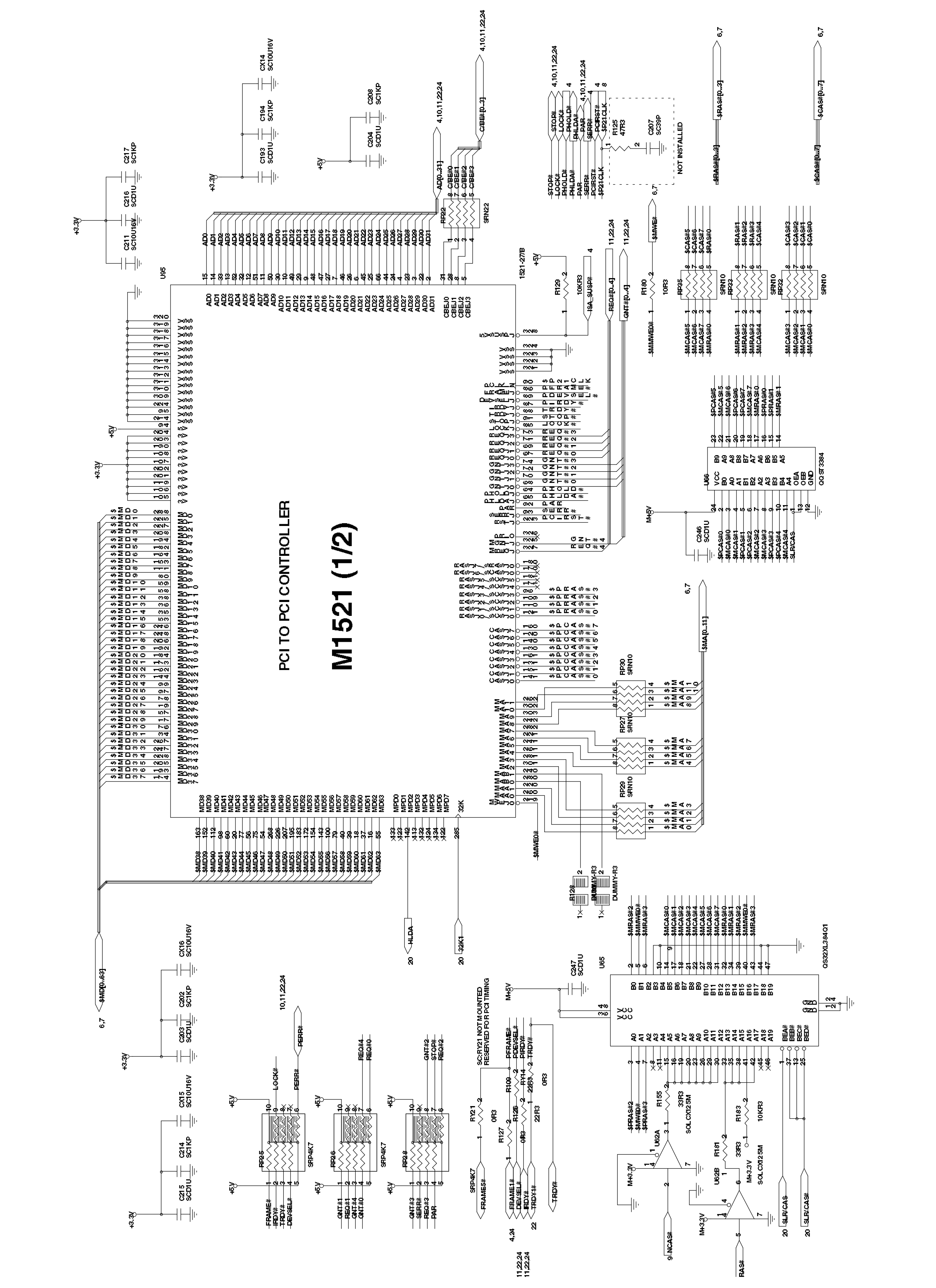


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 2 of 30)

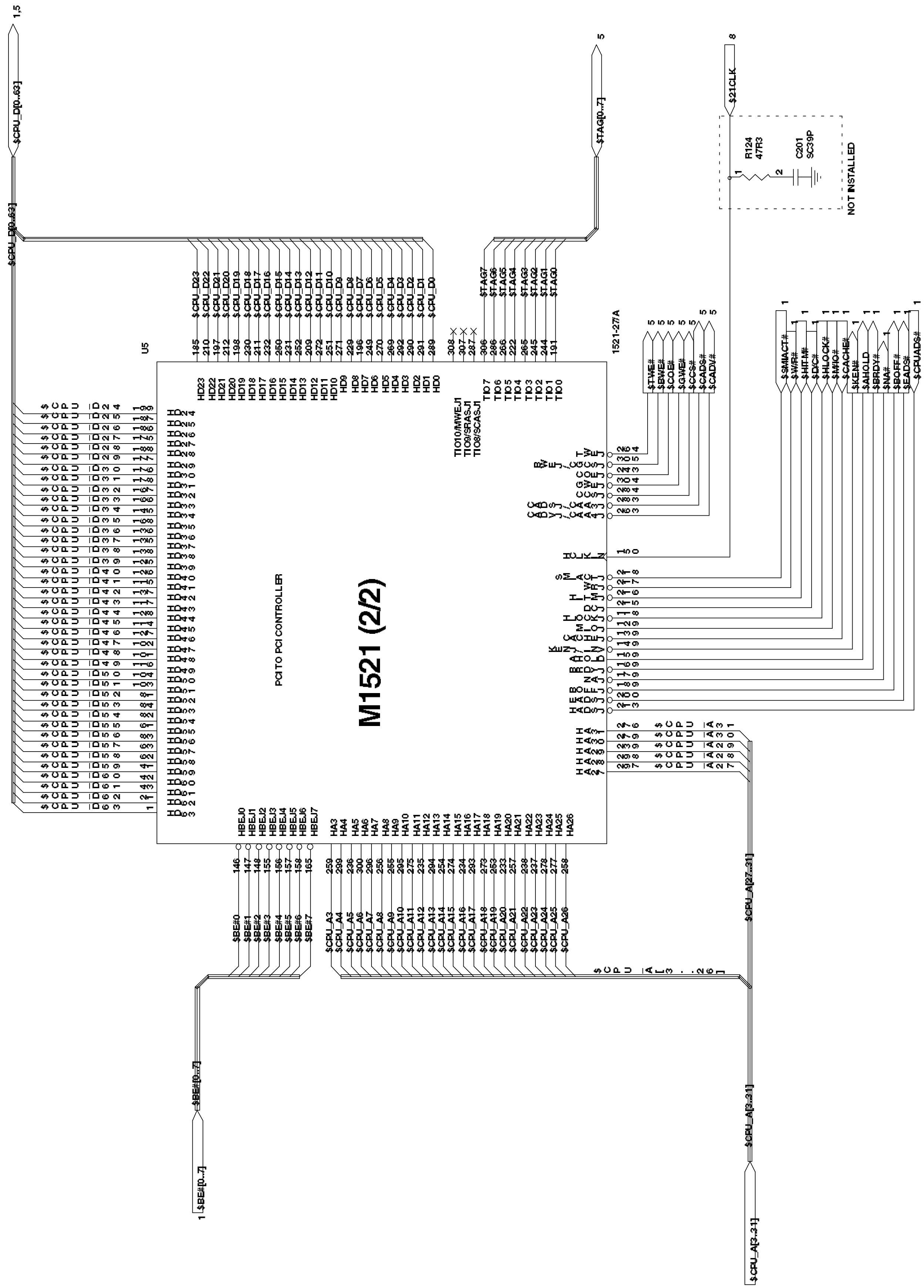


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 3 of 30)

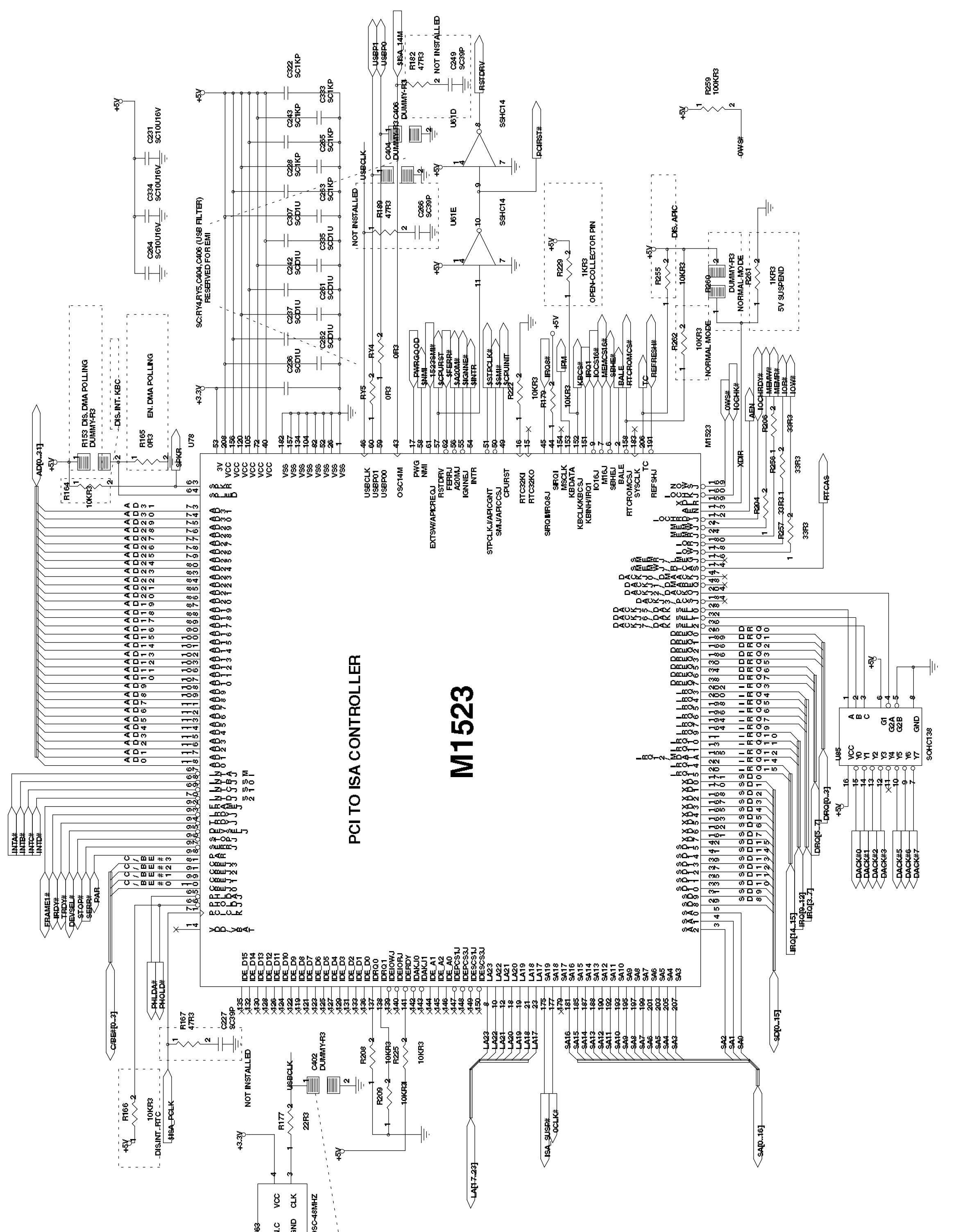


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 4 of 30)

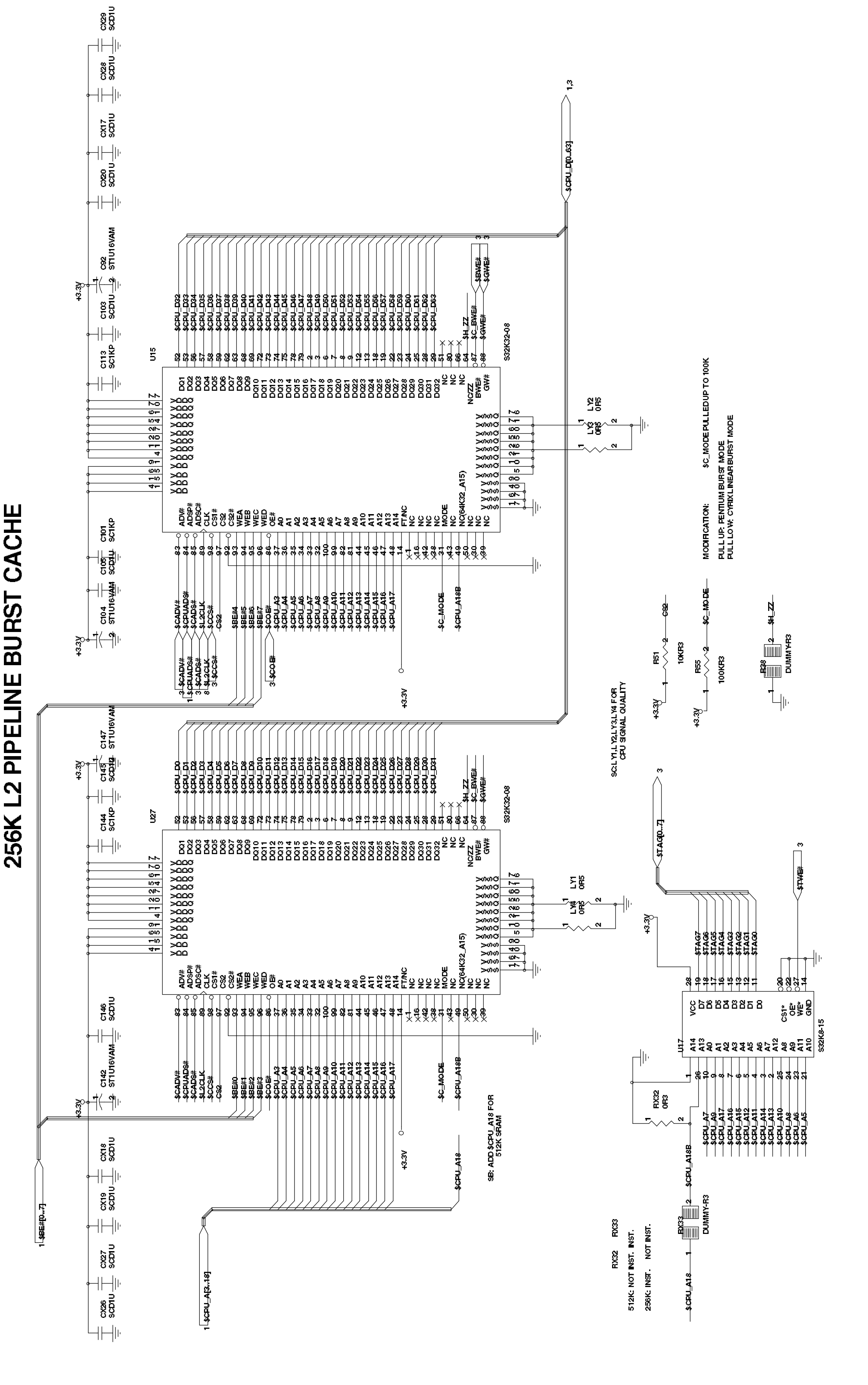


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 5 of 30)

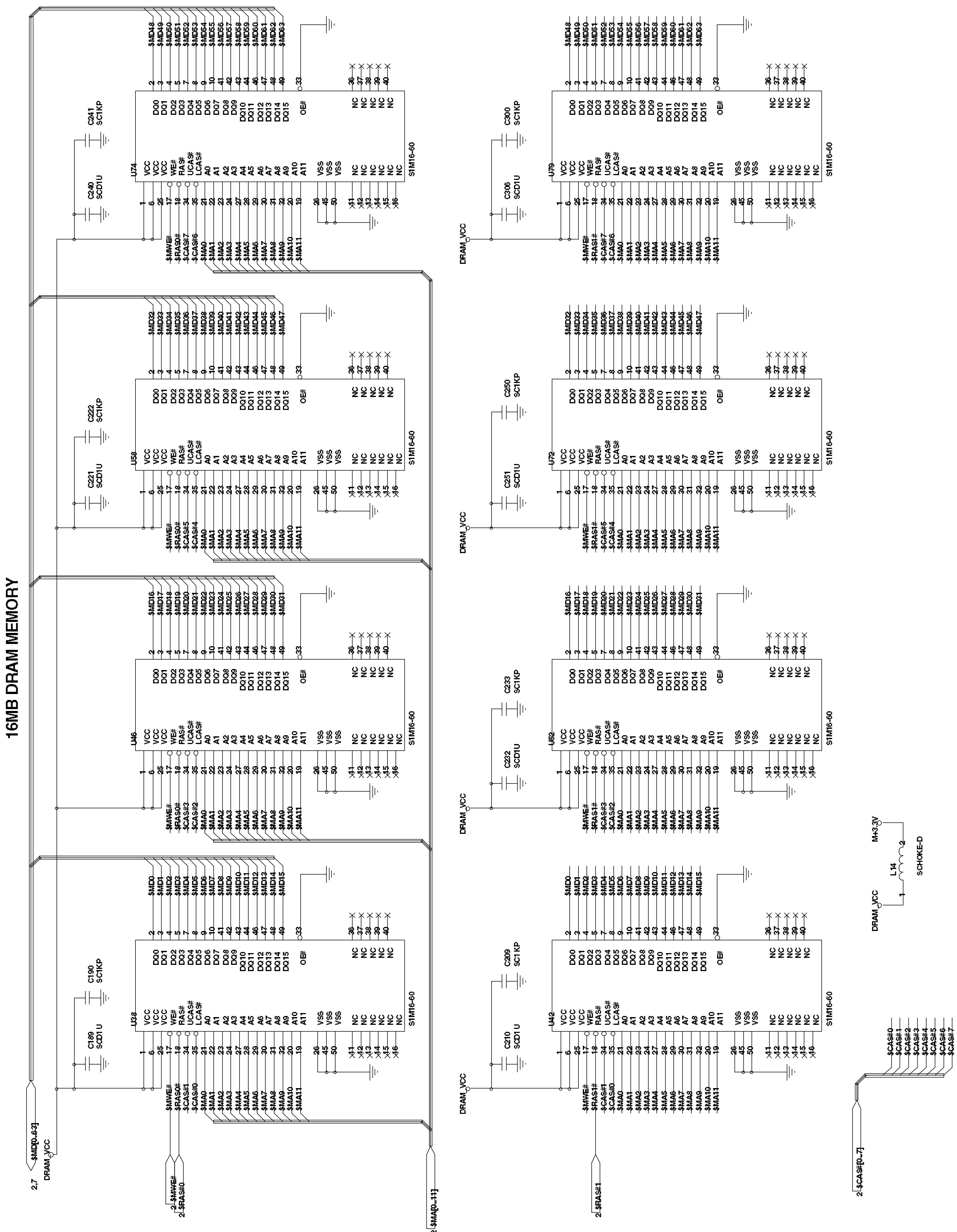


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 6 of 30)

DIMM SOCKET

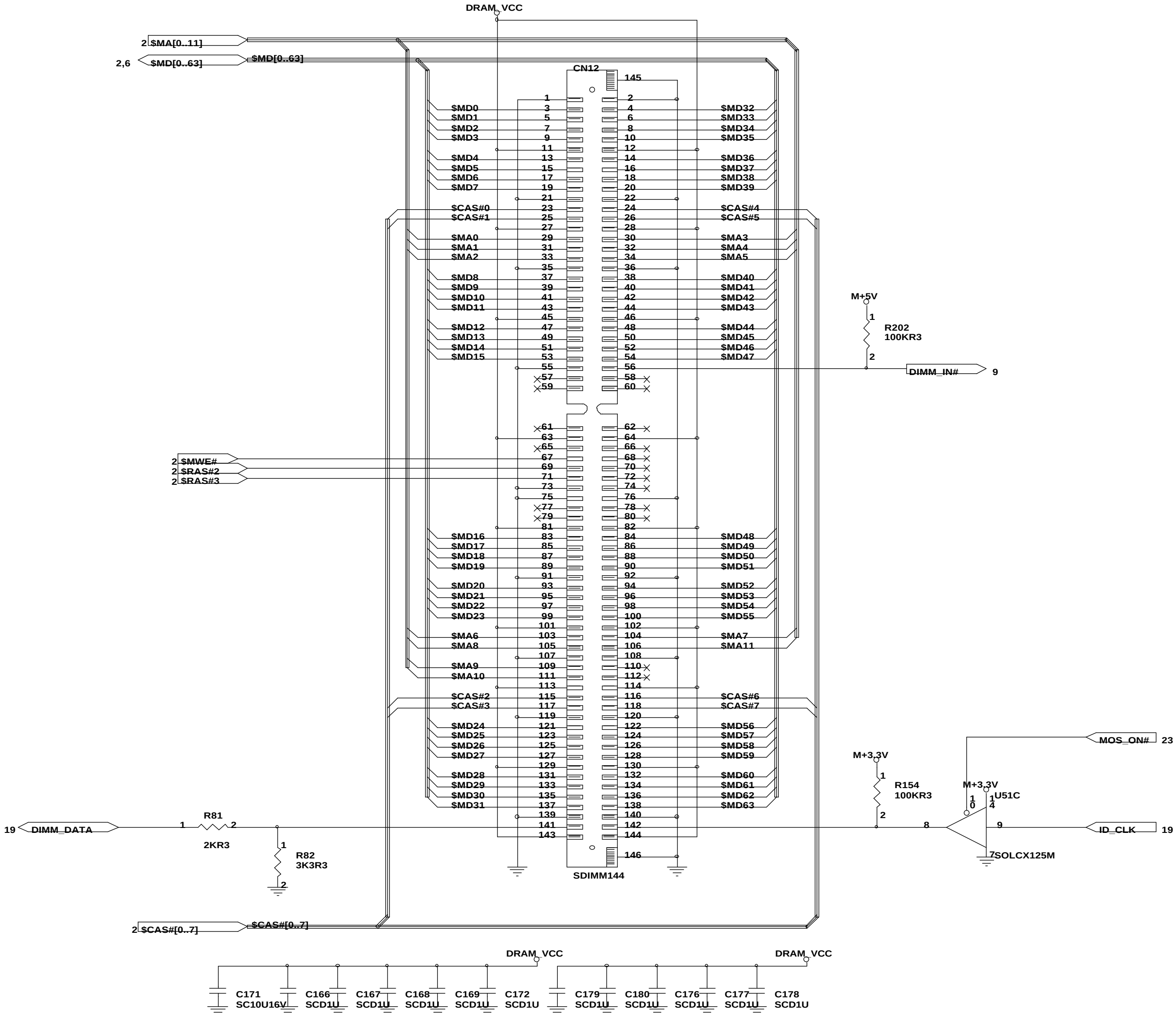


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 7 of 30)

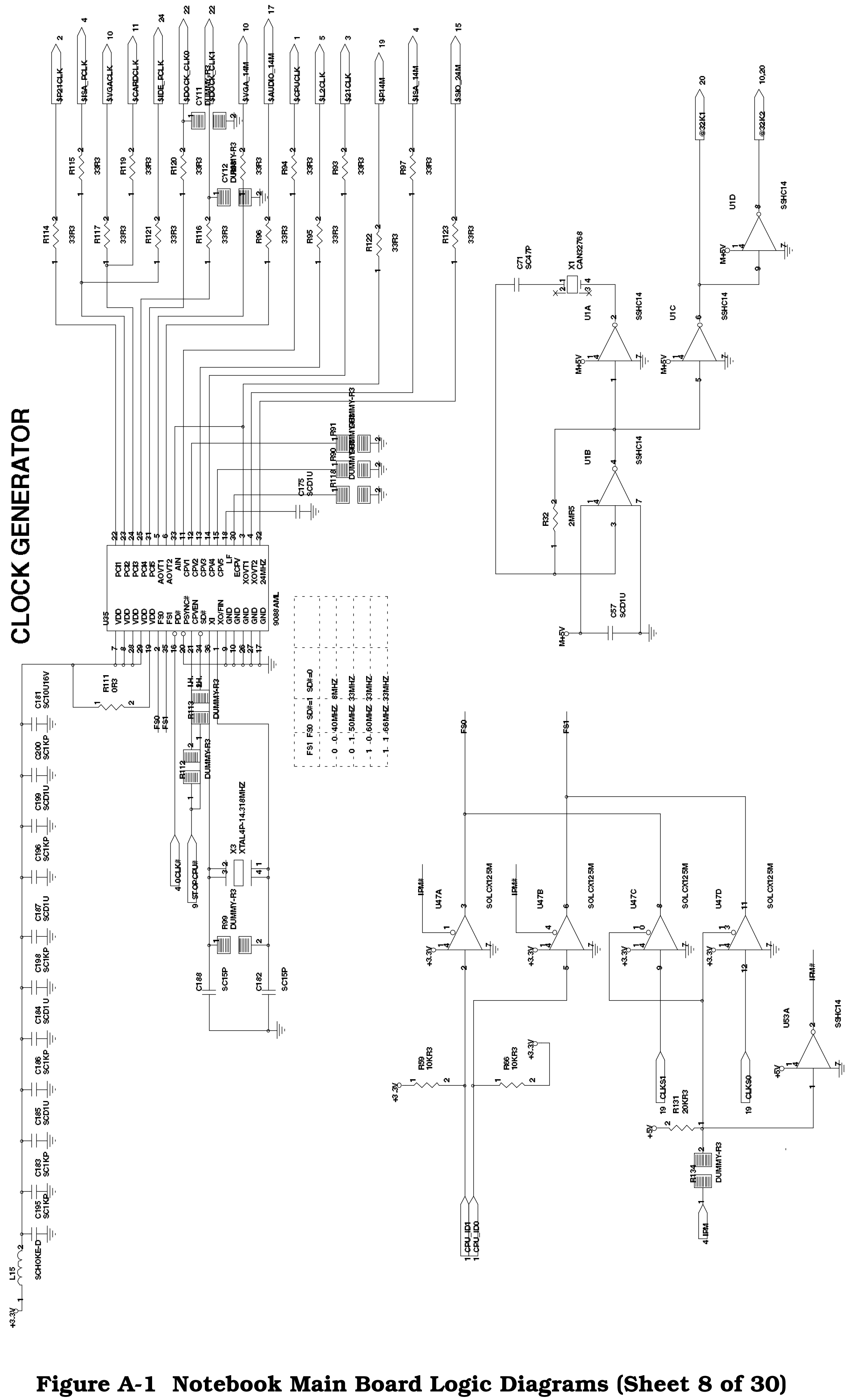


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 8 of 30)

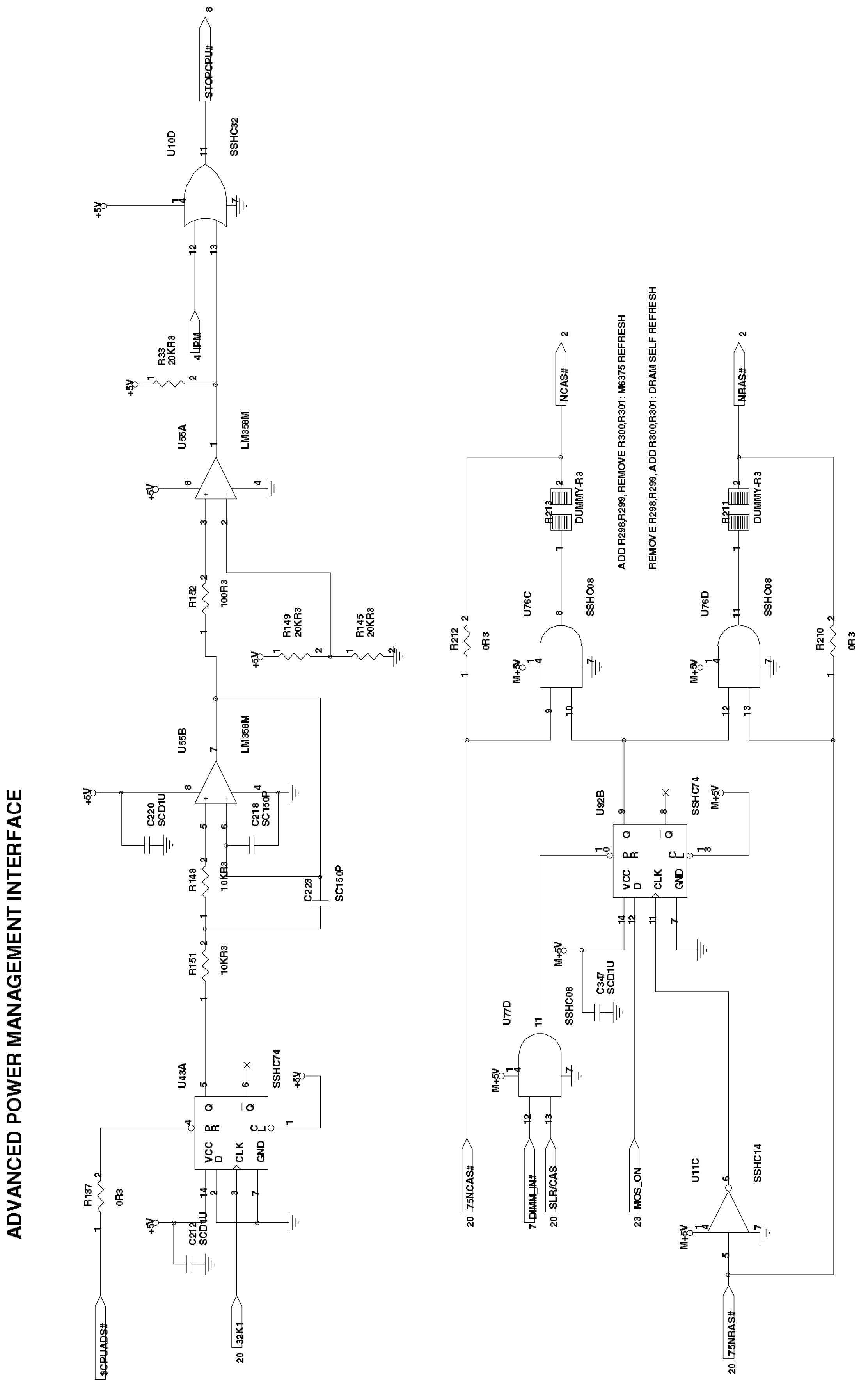


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 9 of 30)

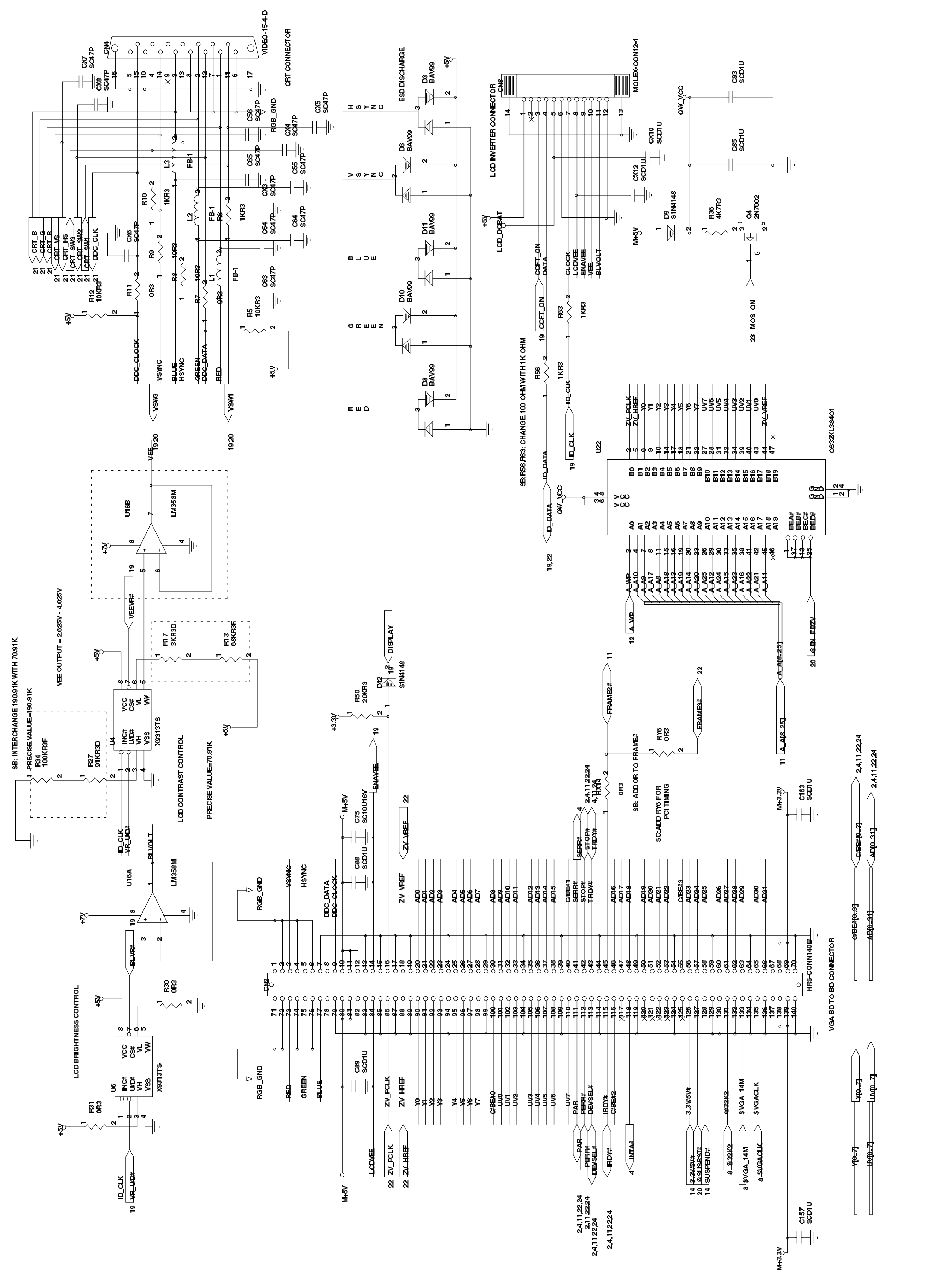


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 10 of 30)

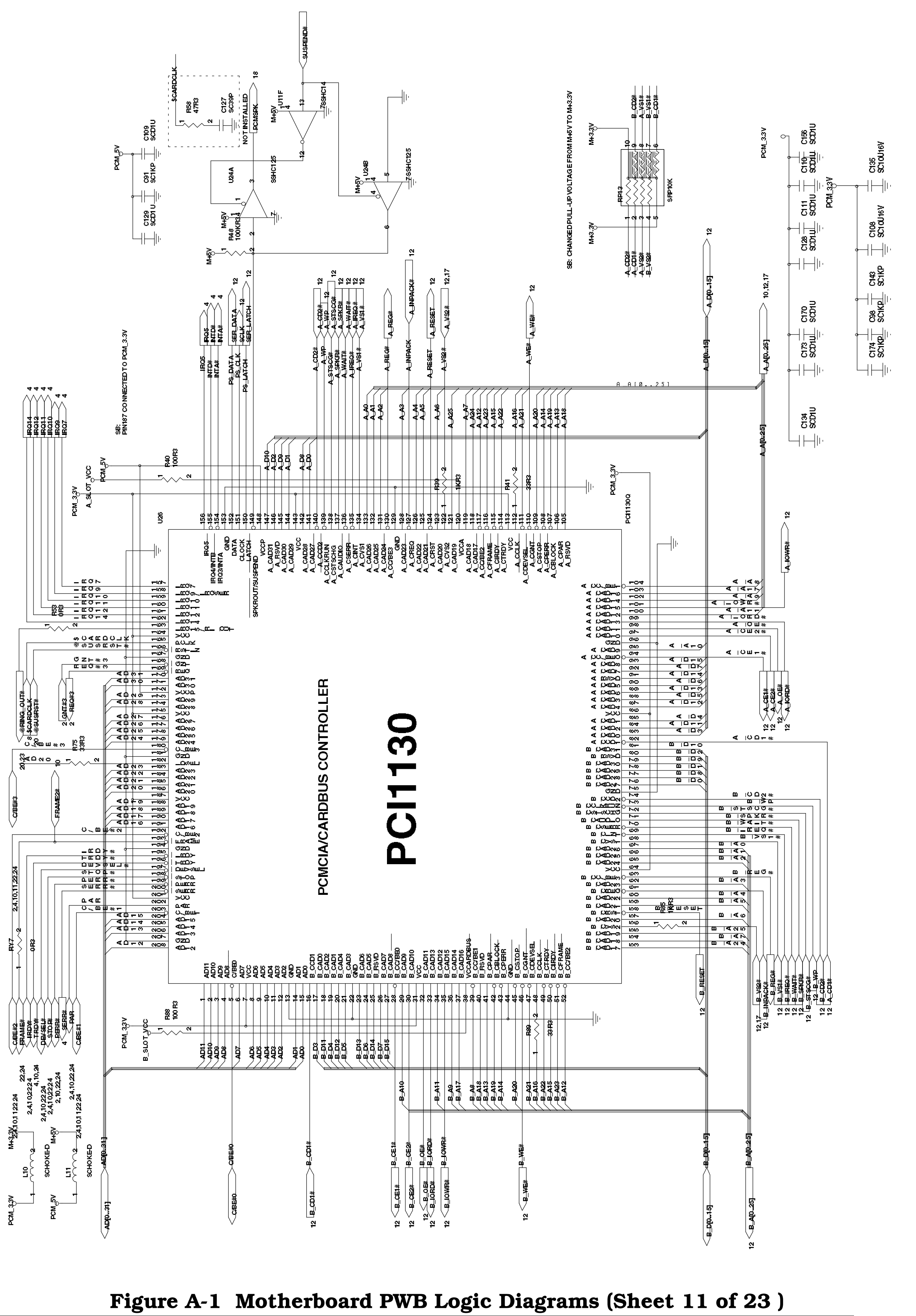


Figure A-1 Motherboard PWB Logic Diagrams (Sheet 11 of 23)

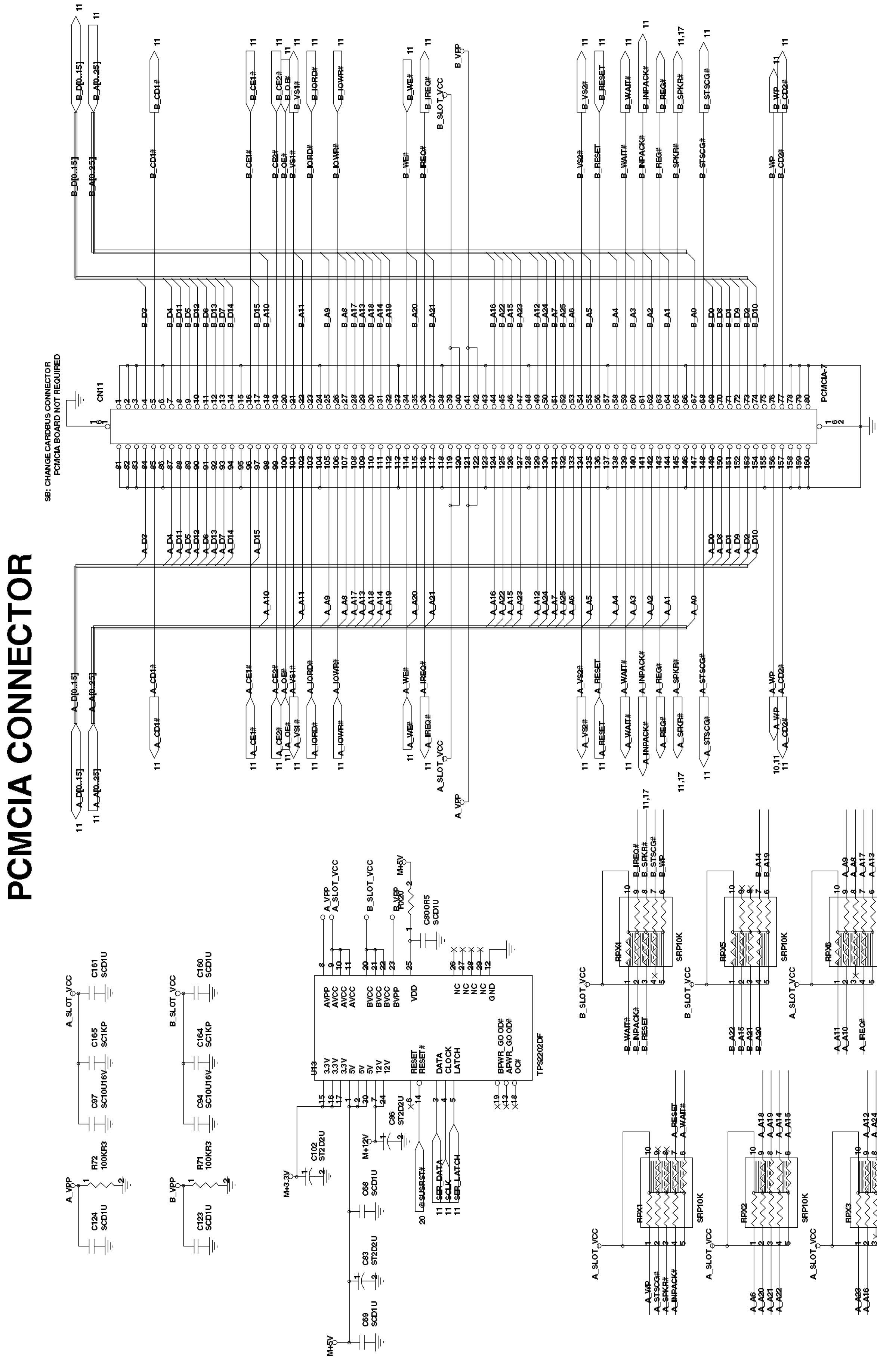


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 12 of 30)

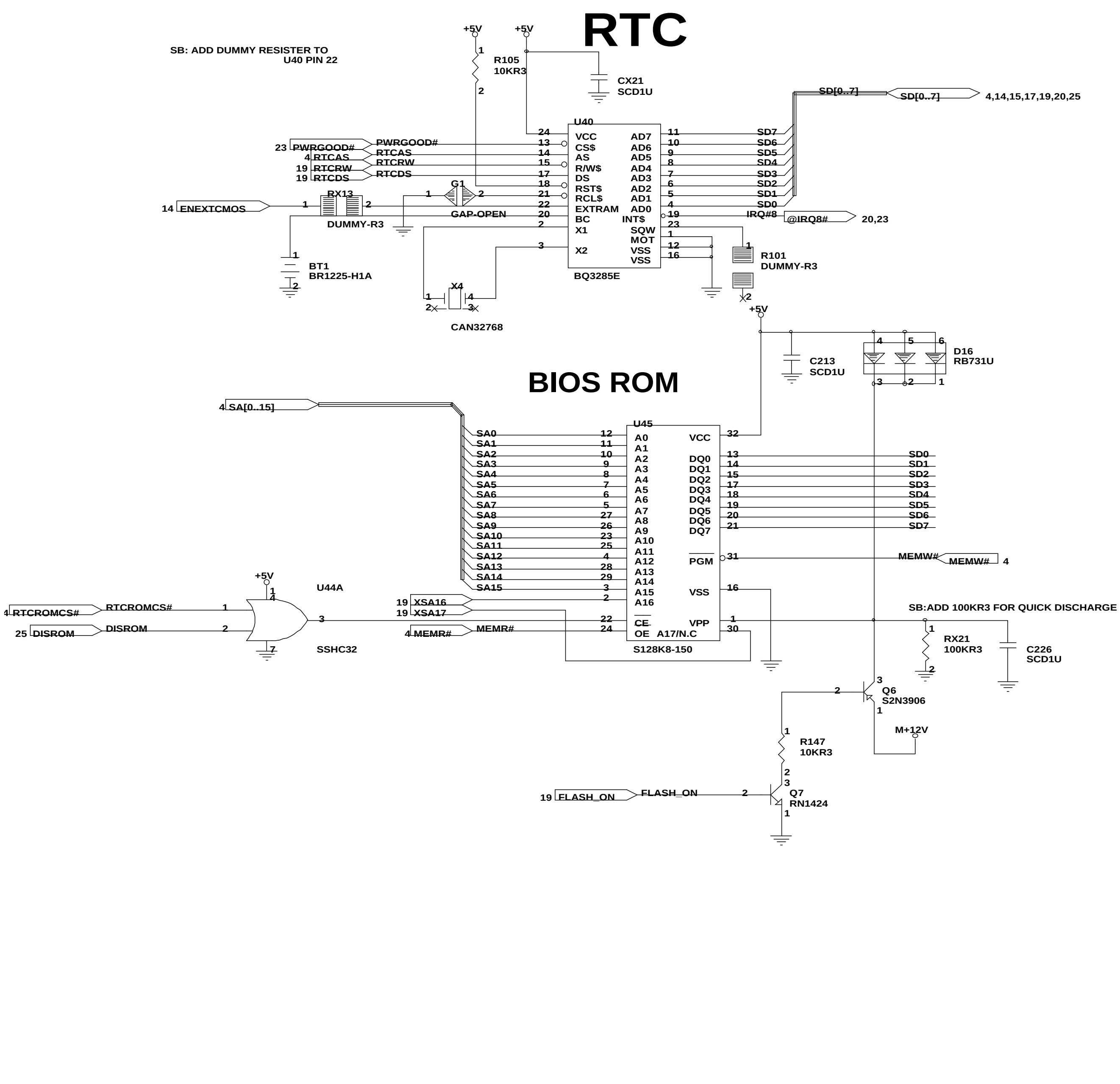


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 13 of 30)

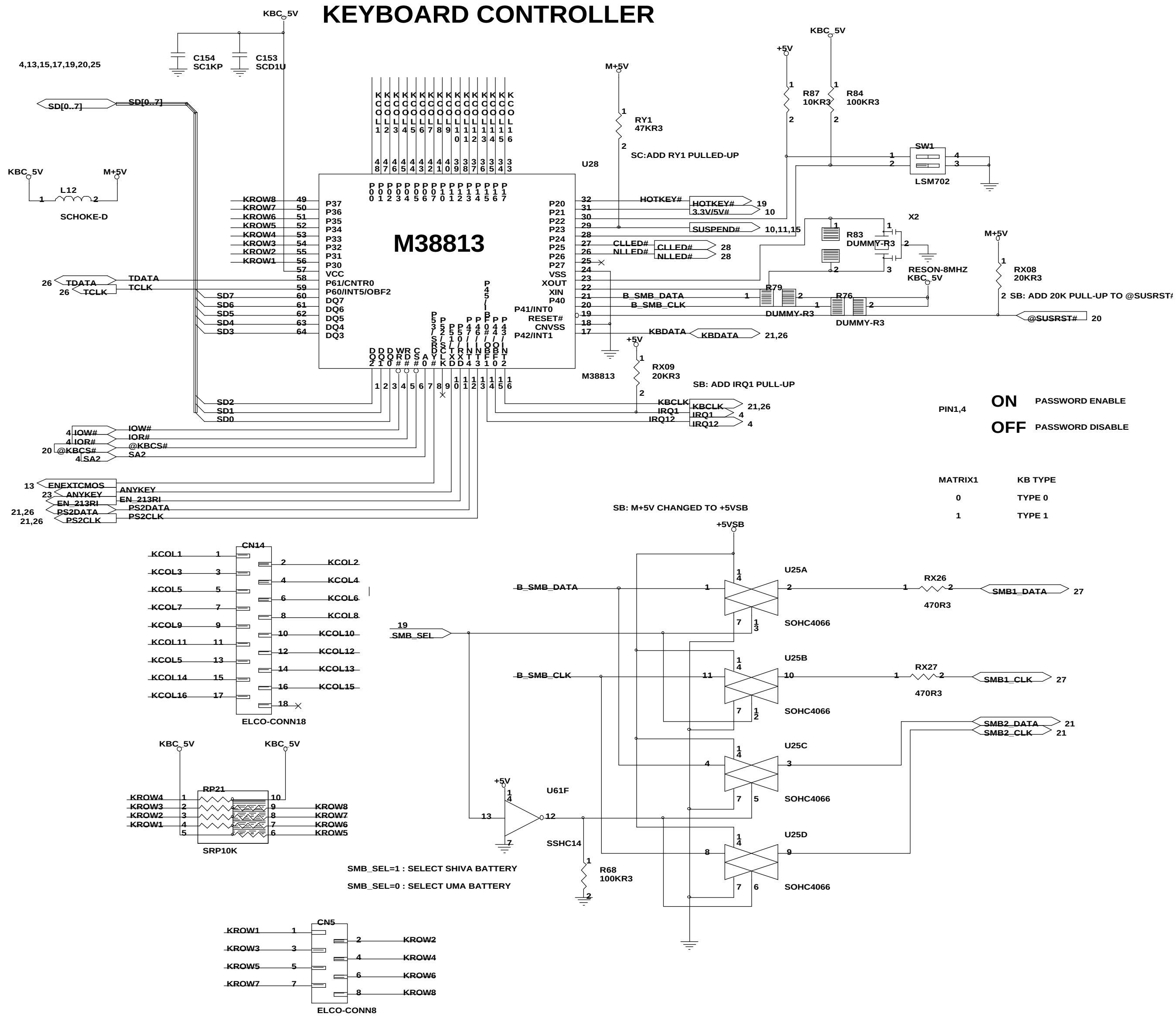
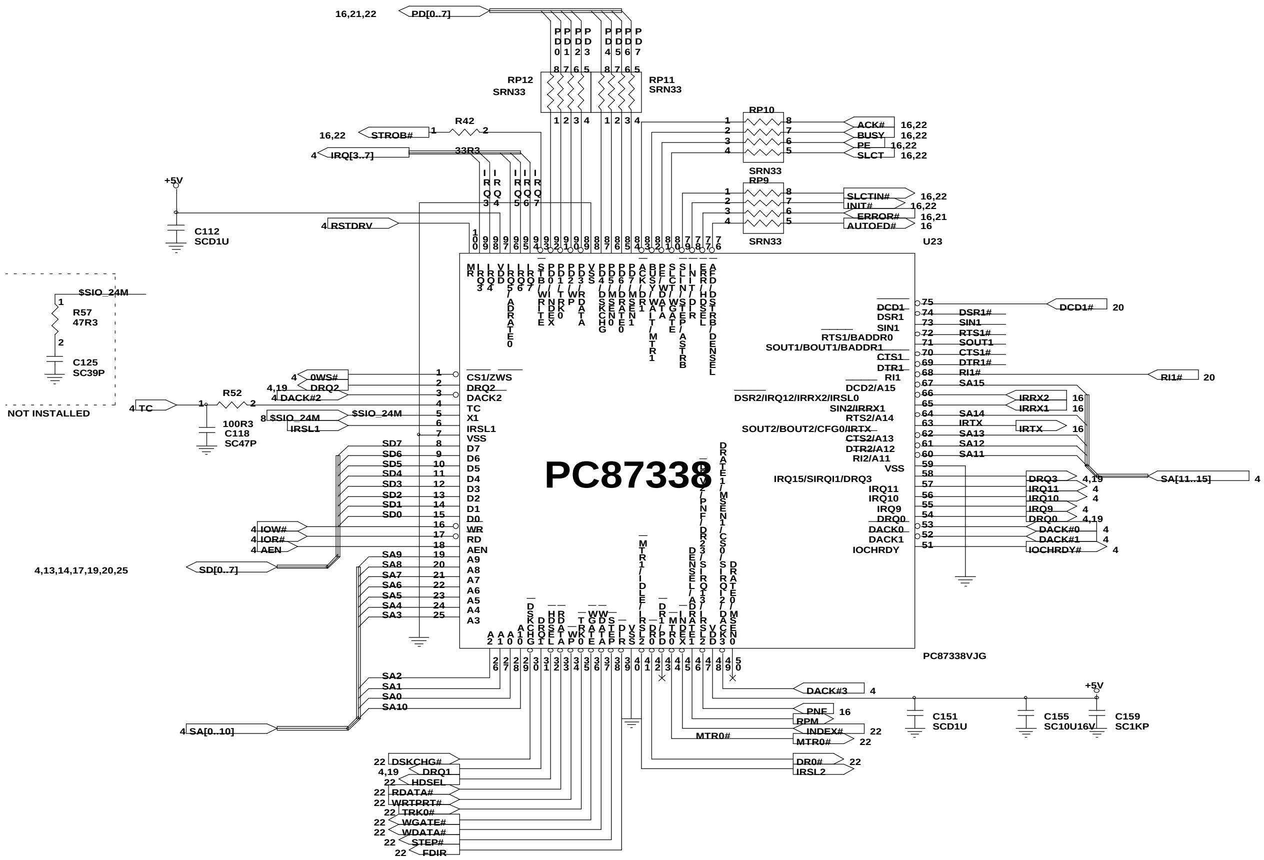


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 14 of 30)

SUPER I/O CONTROLLER



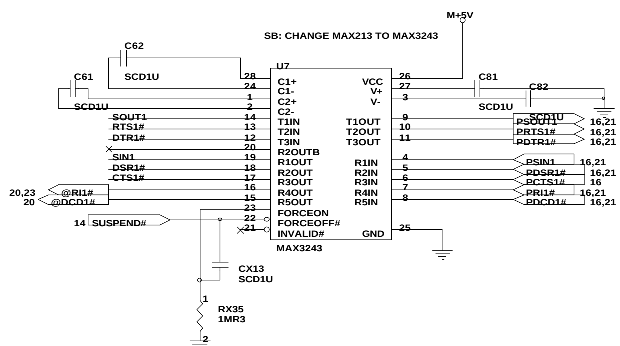


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 15 of 30)

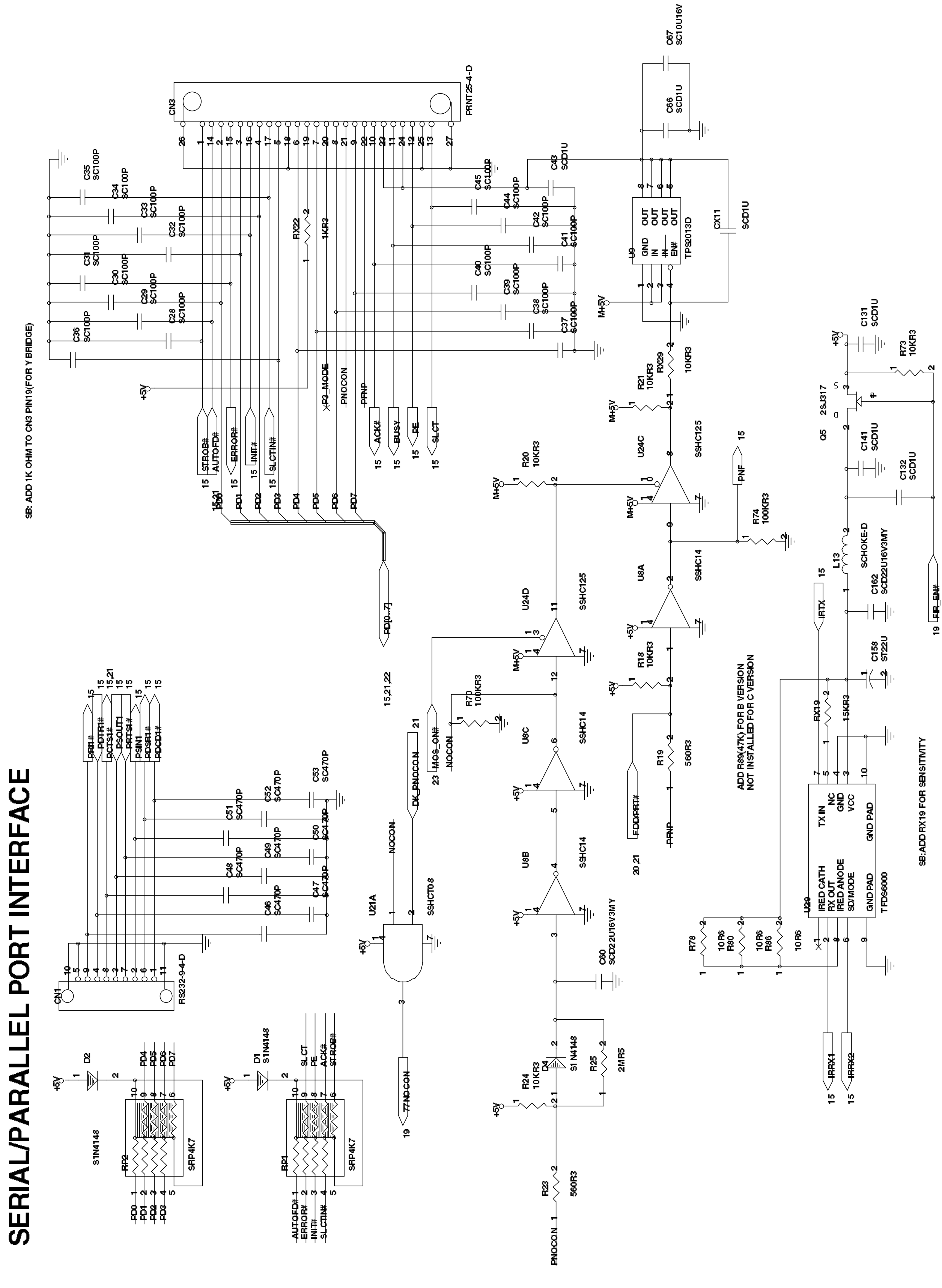


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 16 of 30)

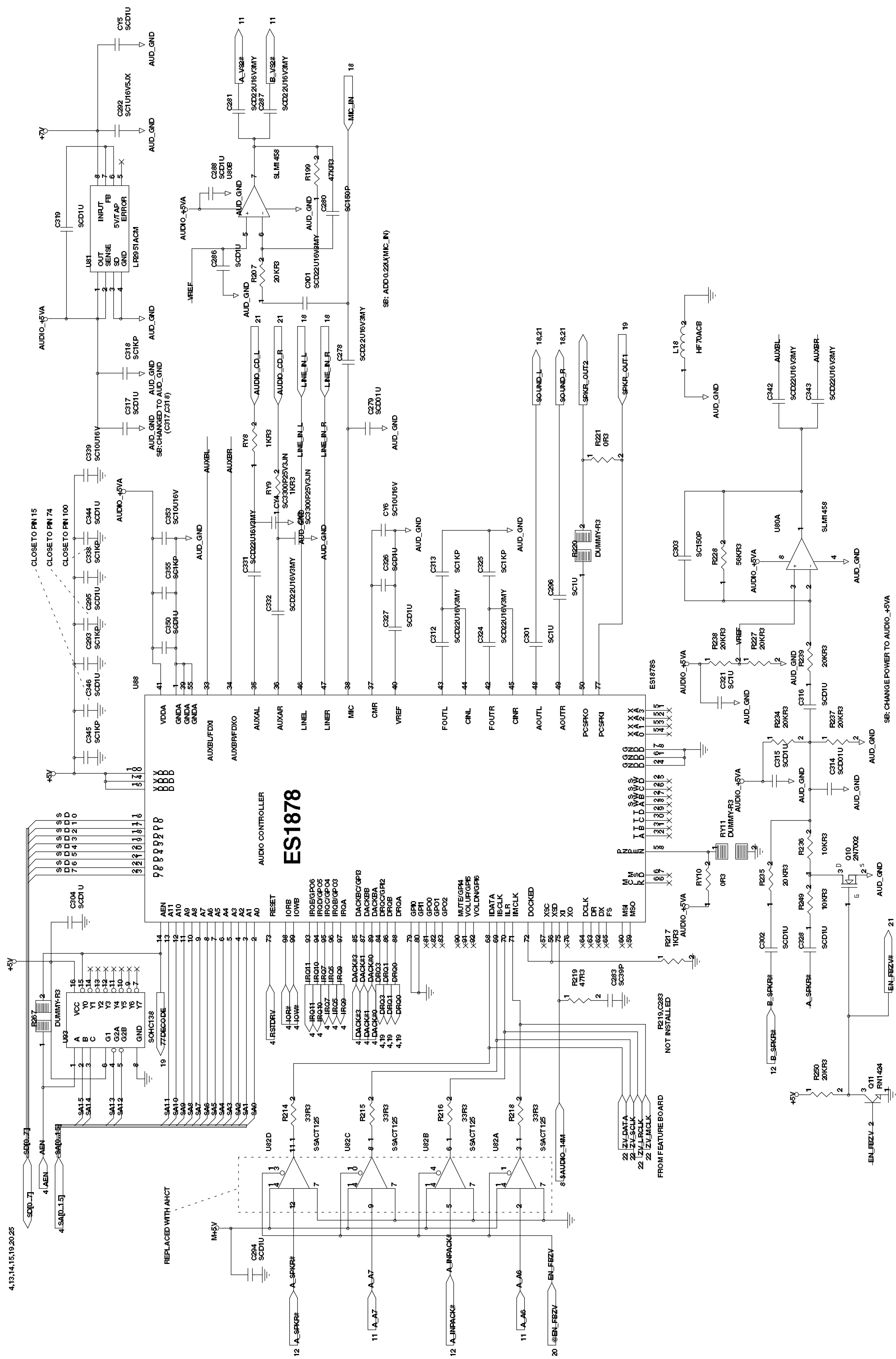


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 17 of 30)

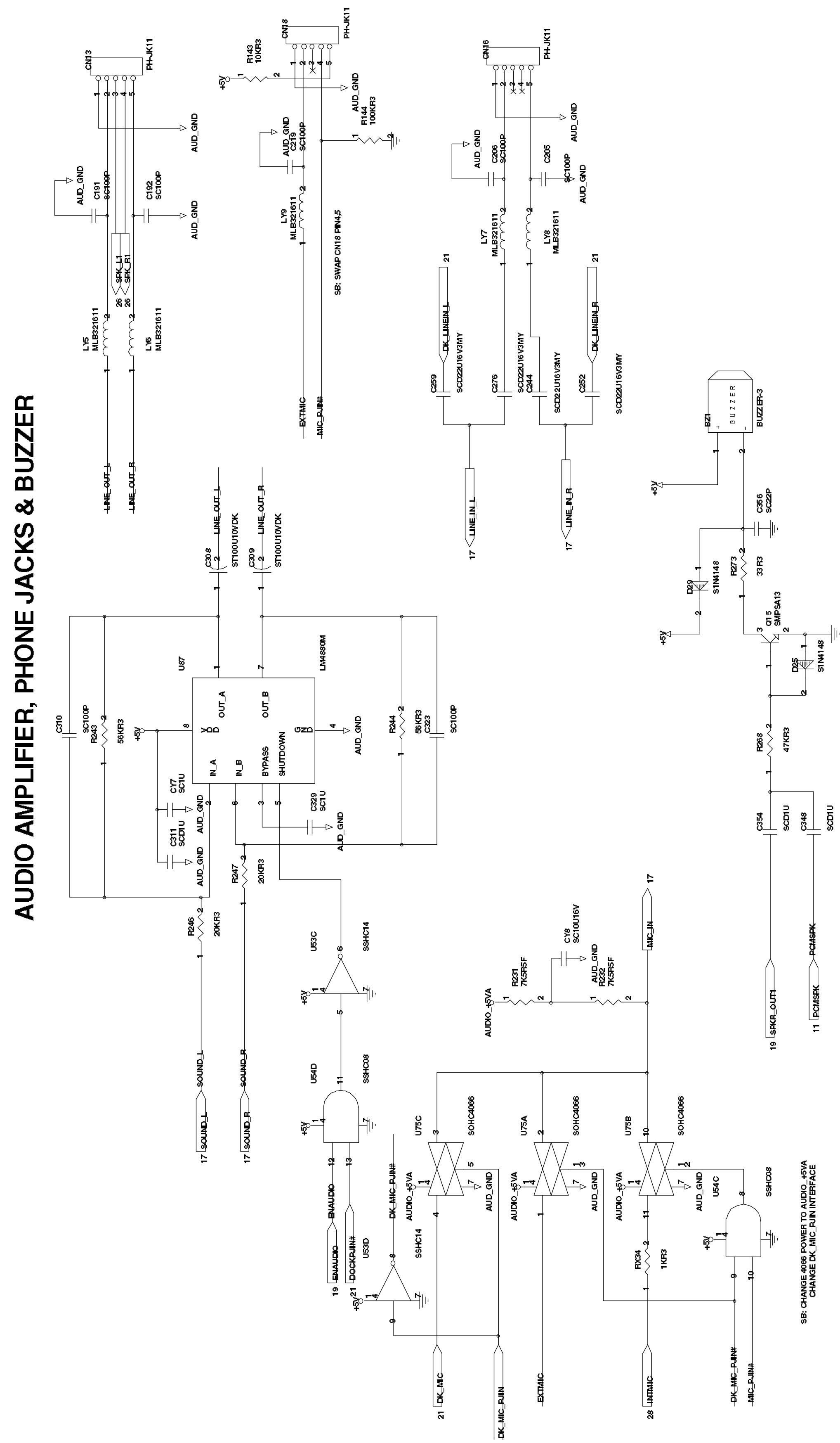


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 18 of 30)

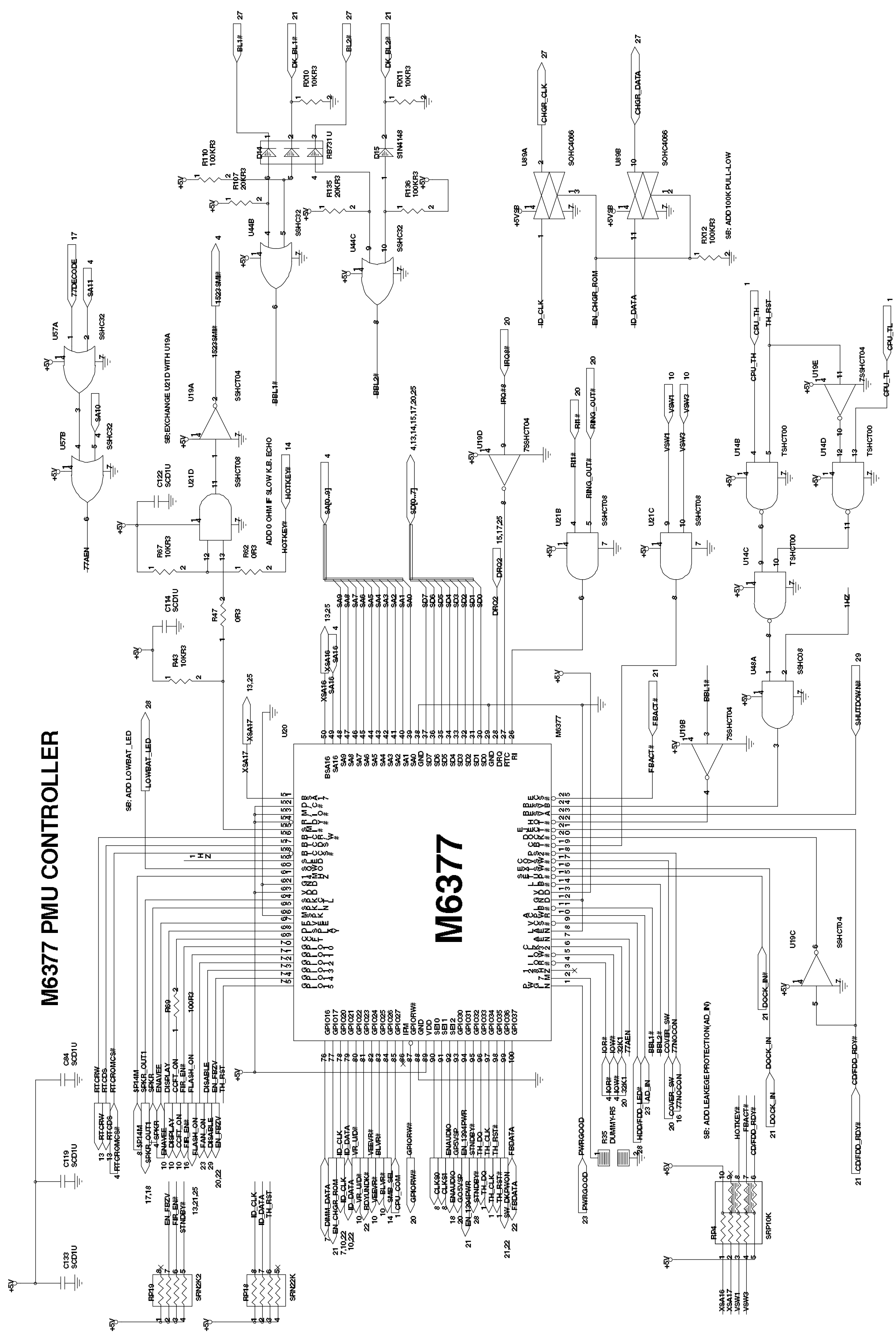


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 19 of 30)

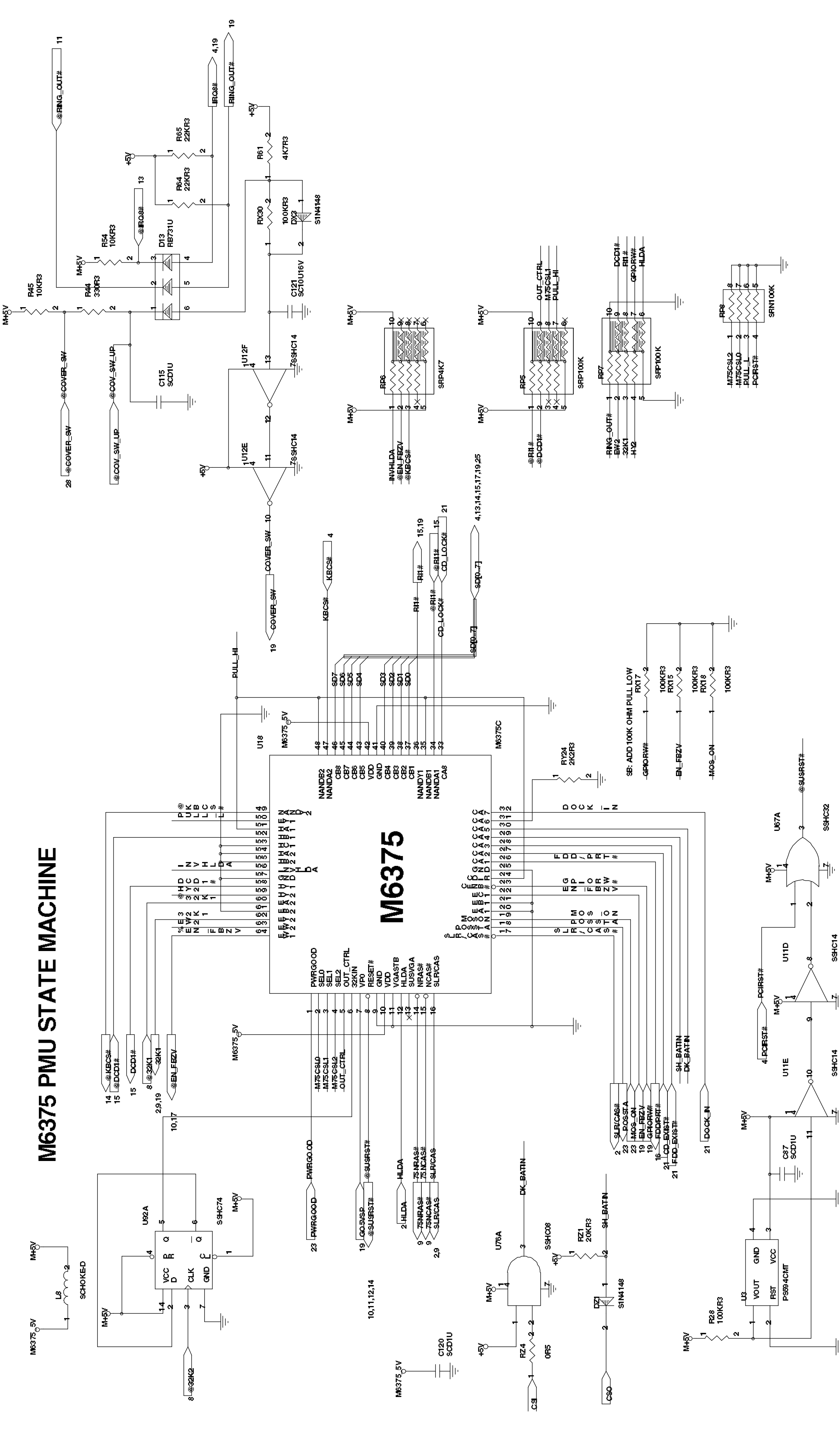


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 20 of 30)

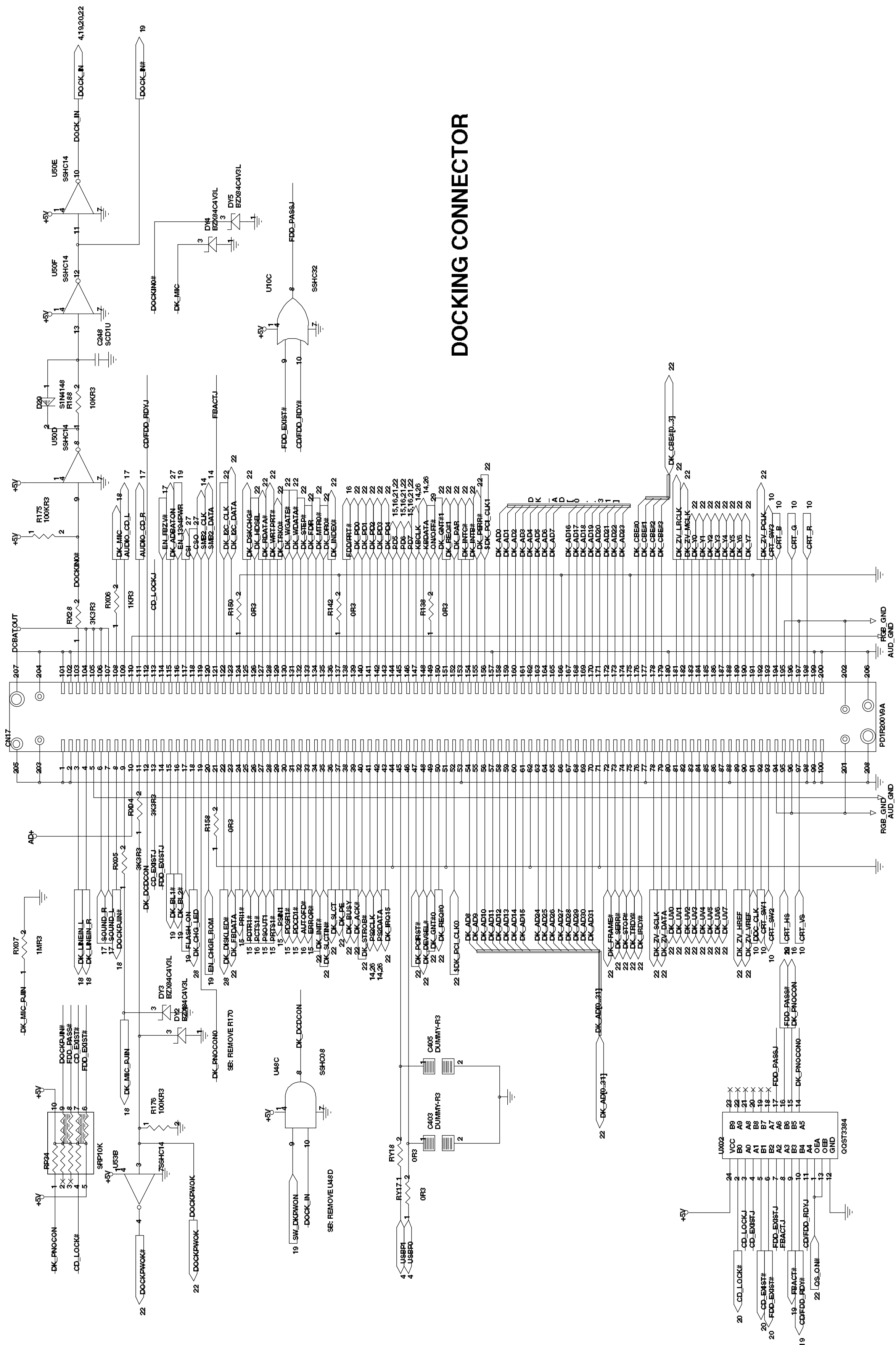


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 21 of 30)

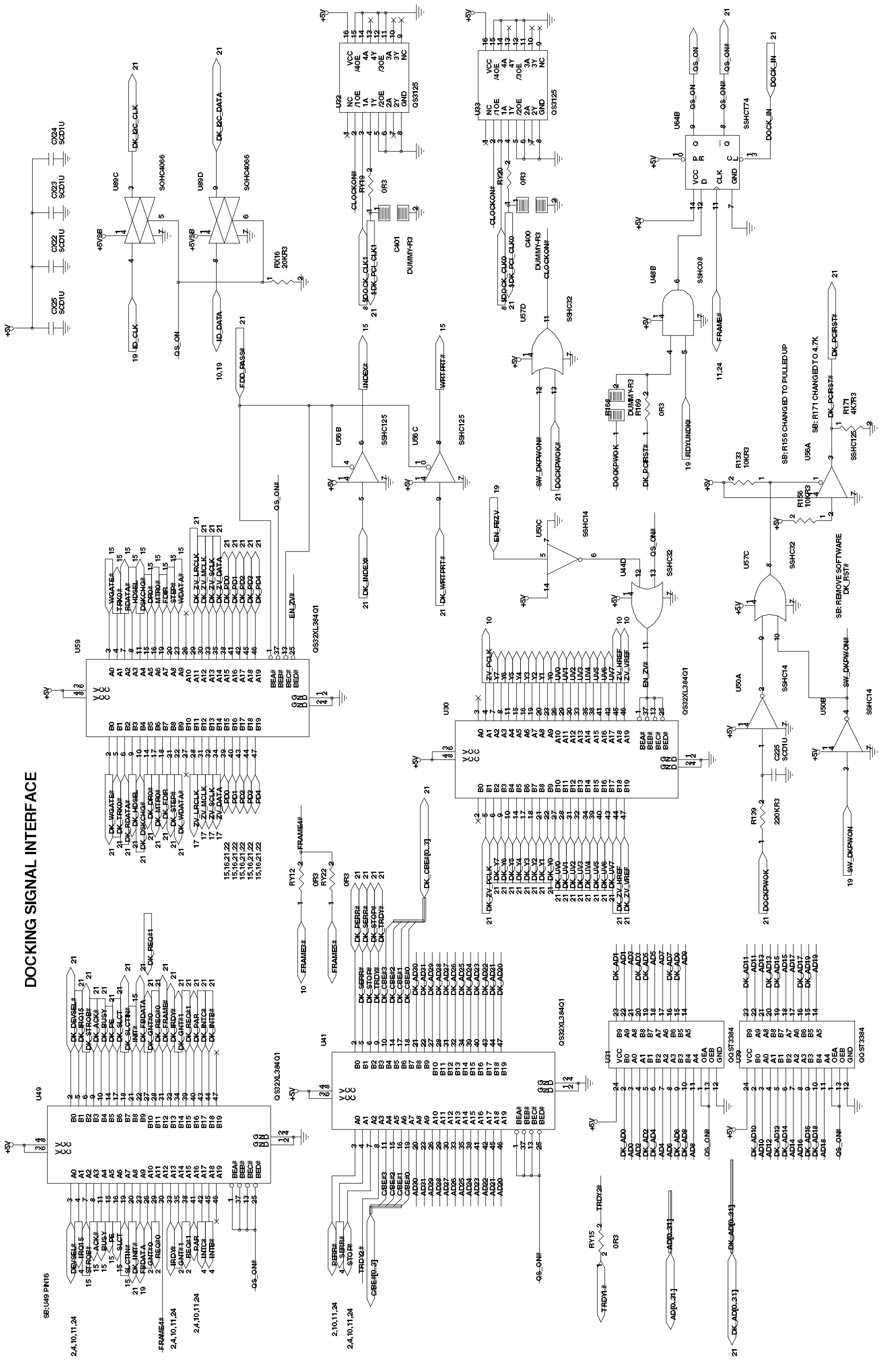


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 22 of 30)

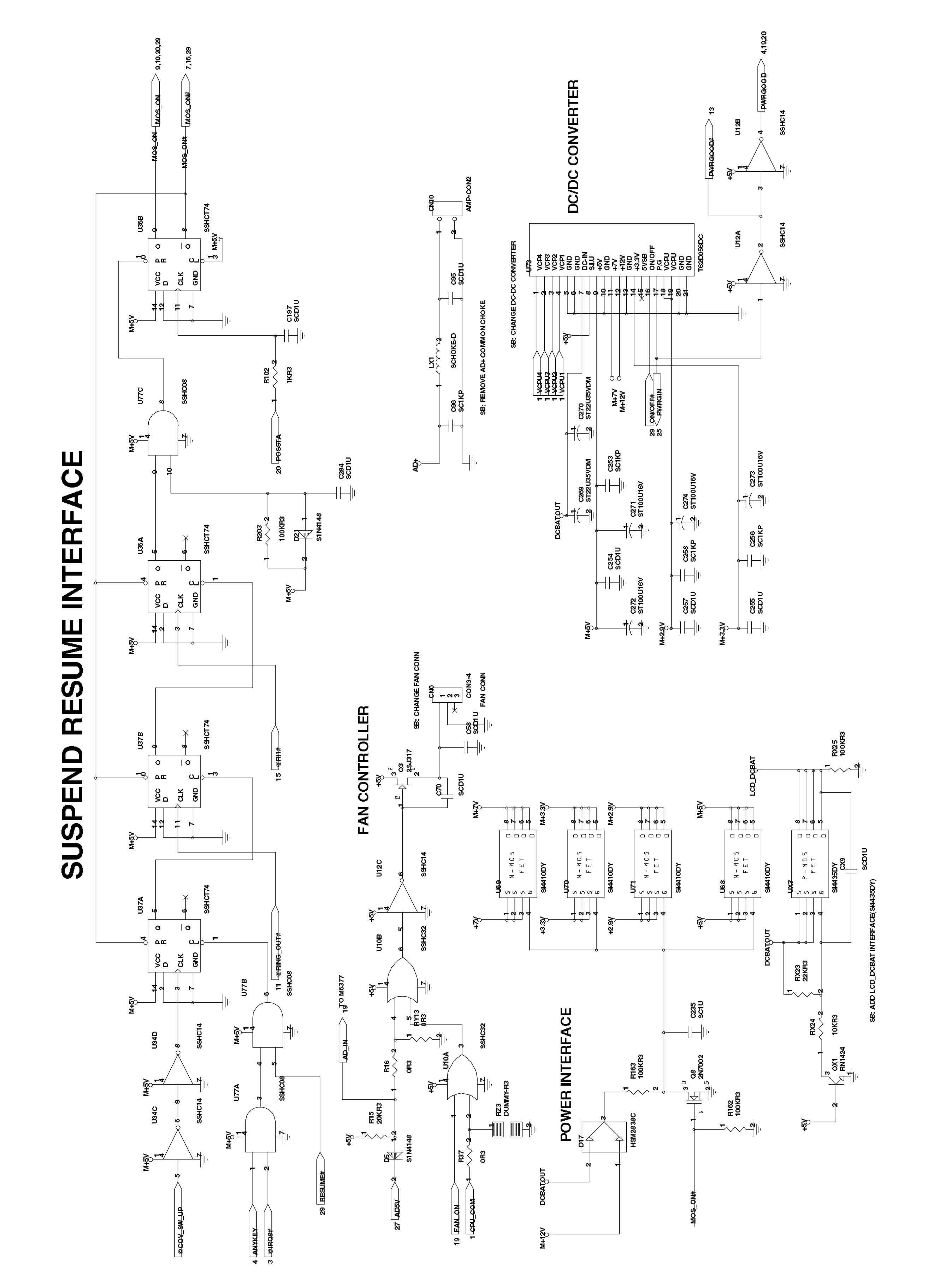


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 23 of 30)

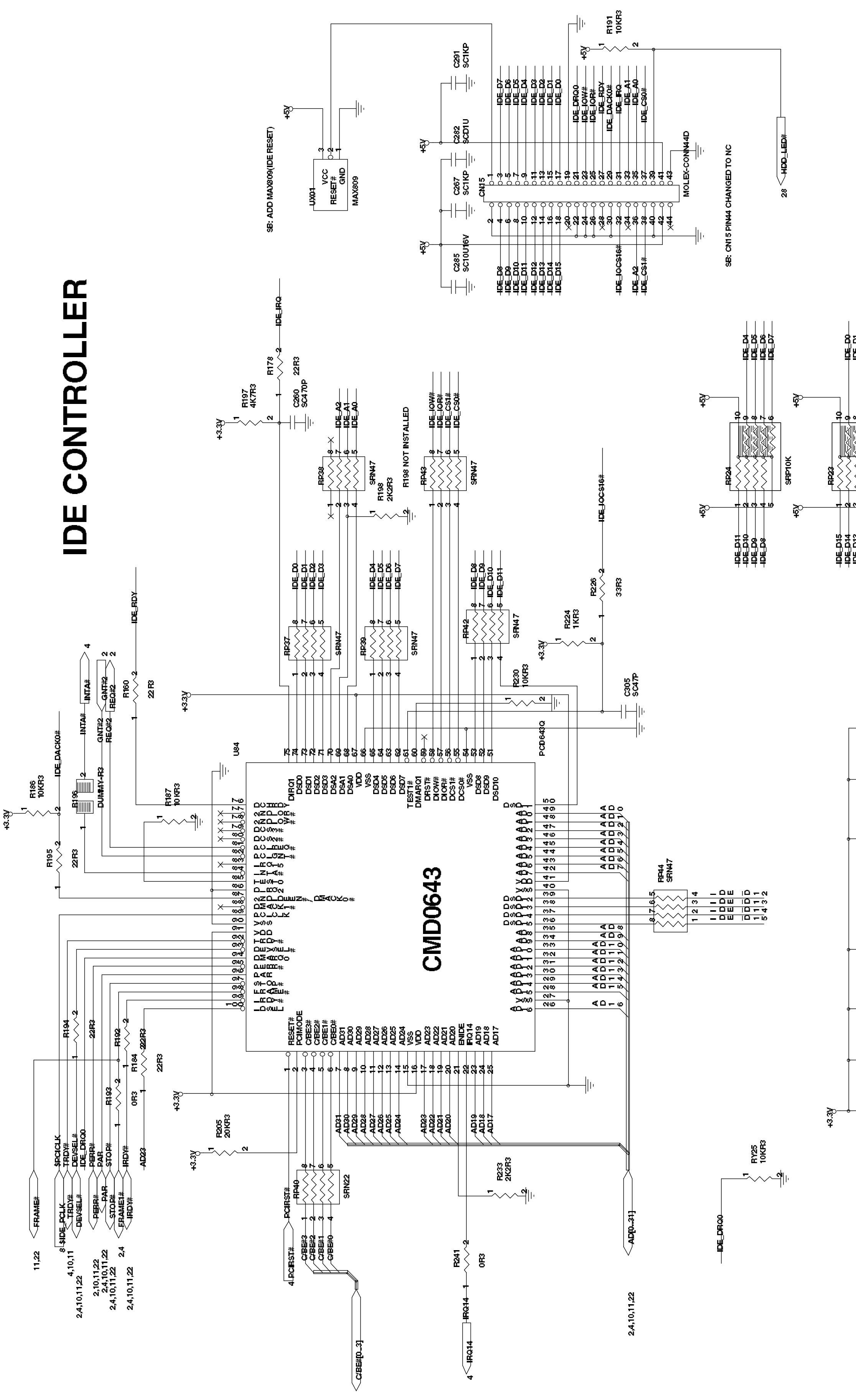


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 24 of 30)

DEBUG-BD GOLDEN FINGER

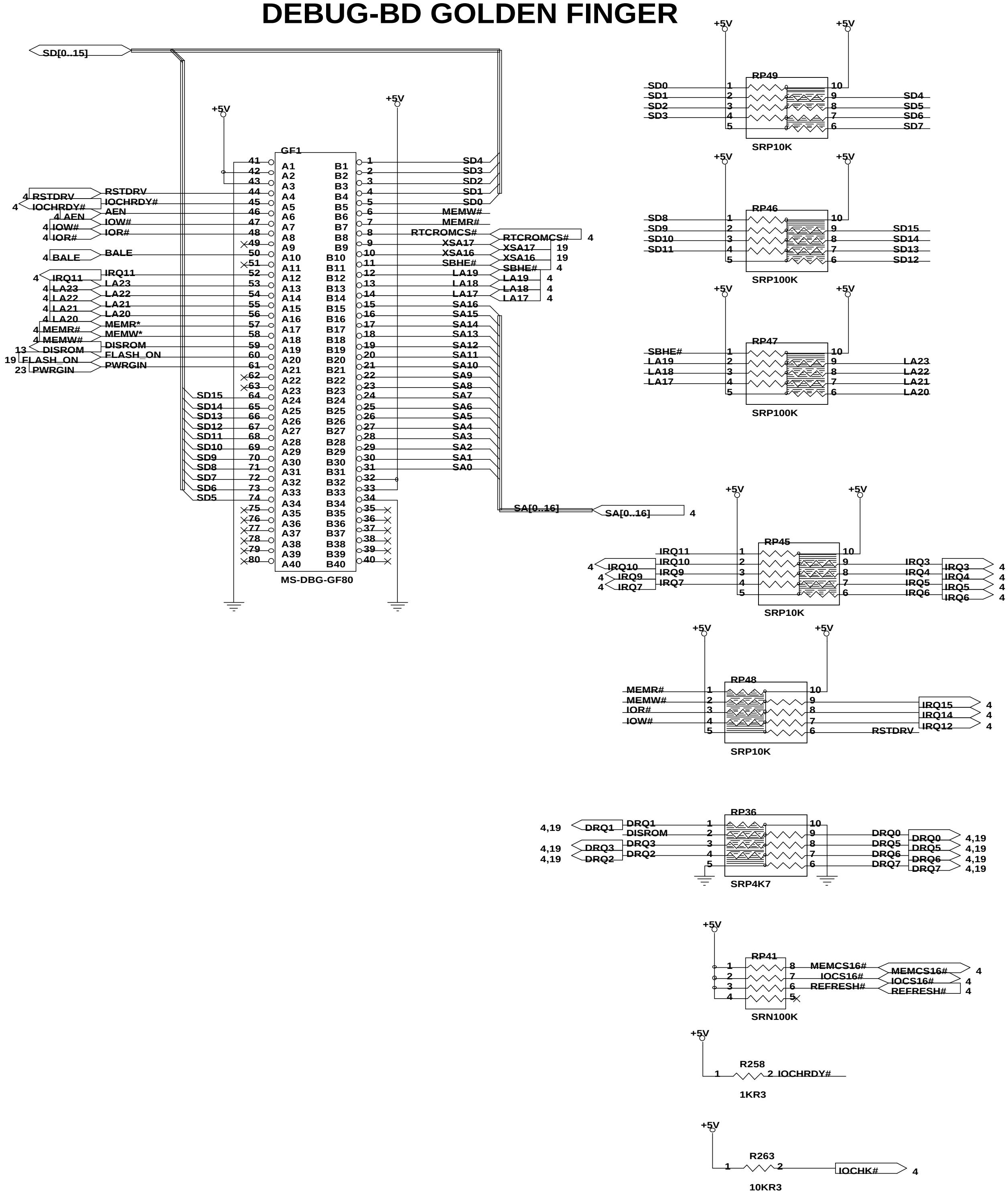
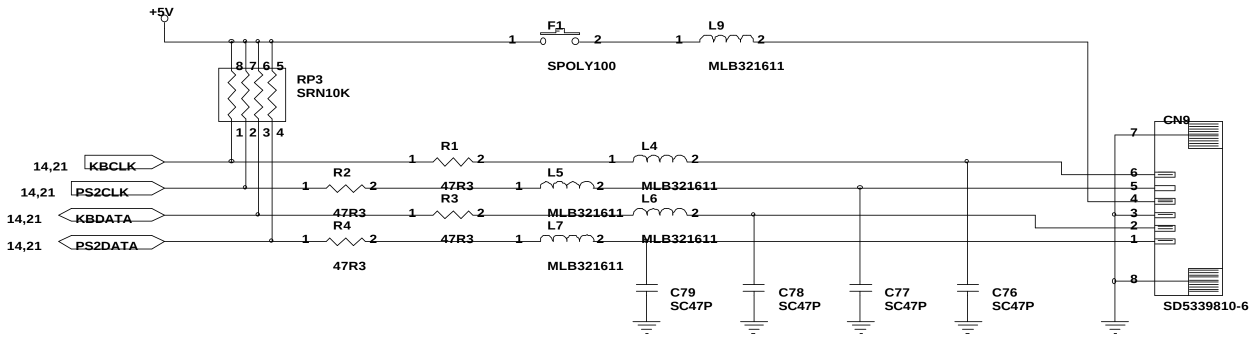
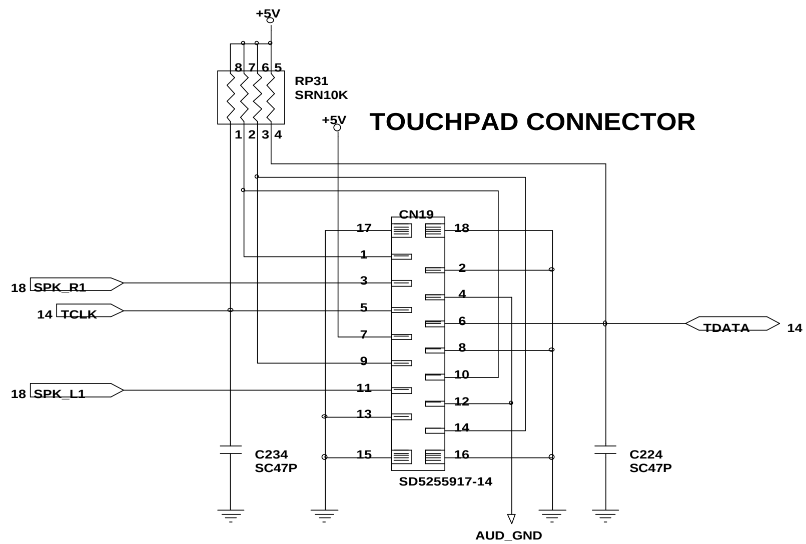


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 25 of 30)

PS2 INTERFACE





SB: CHANGE CN19 PIN DEFINITION

Figure A-1 Notebook Main Board Logic Diagrams (Sheet 26 of 30)

CHARGER INTERFACE CIRCUIT

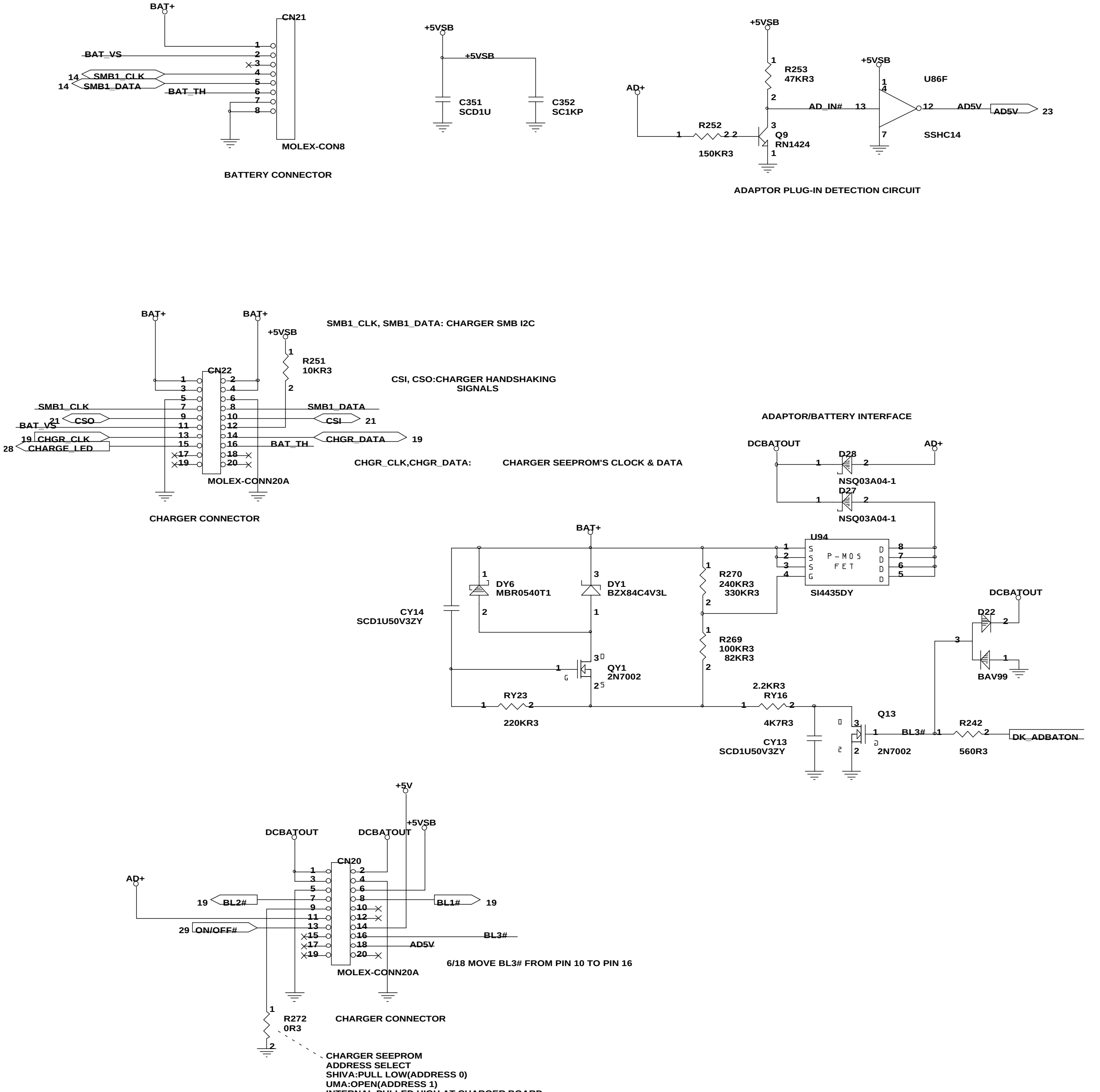


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 27 of 30)

LED INTERFACE

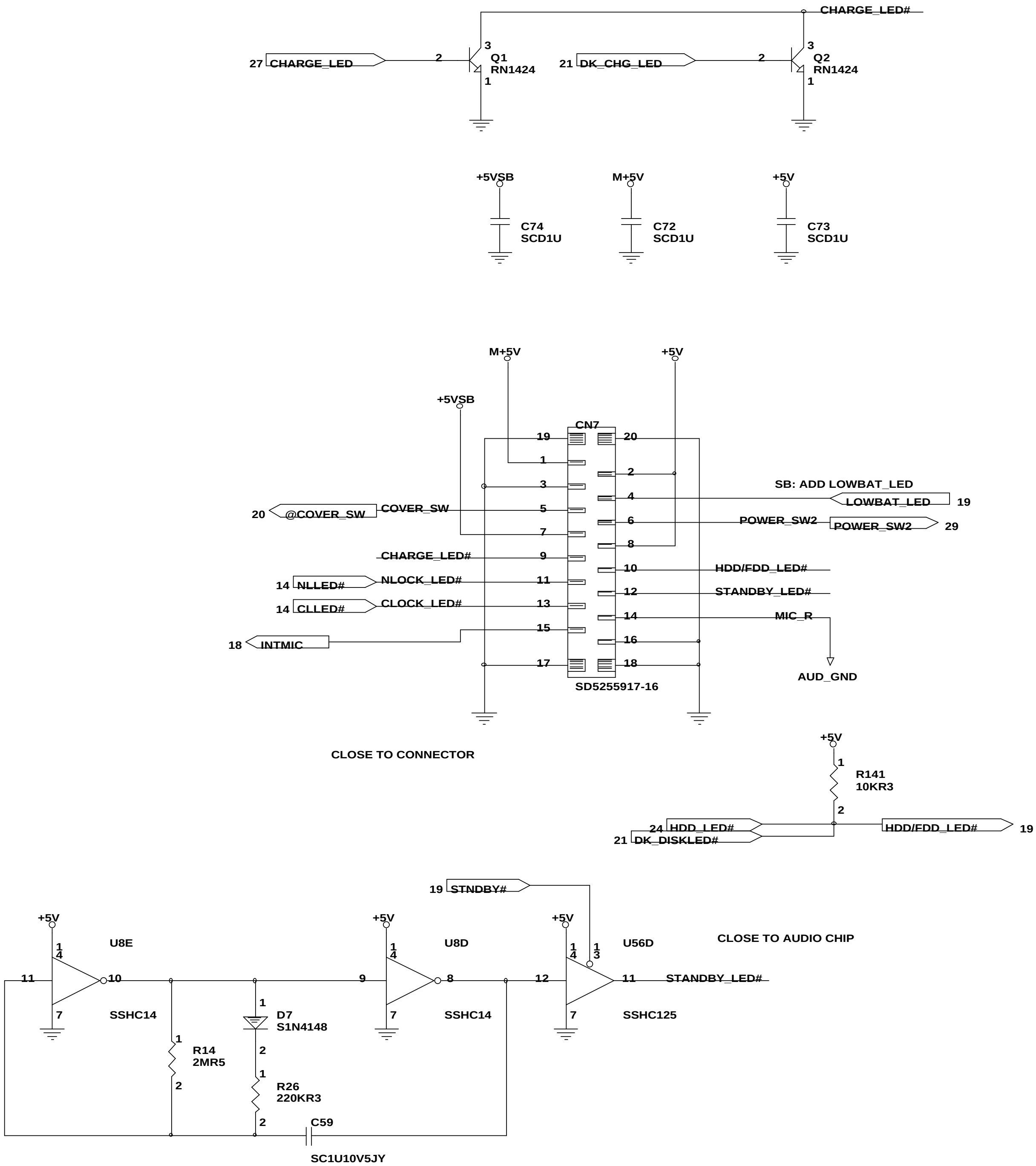


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 28 of 30)



Figure A-1 Notebook Main Board Logic Diagrams (Sheet 29 of 30)

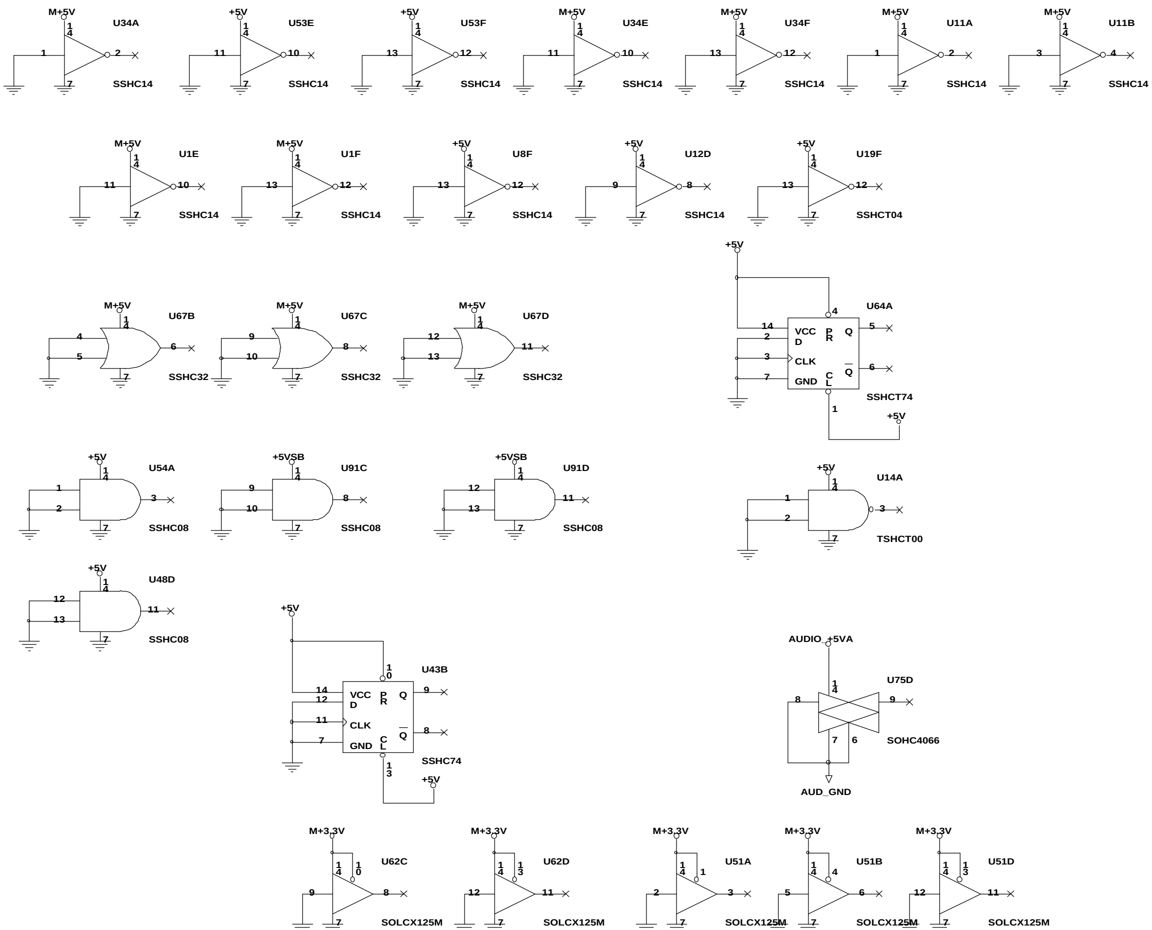


Figure A-1 Notebook Main Board Logic Diagrams (Sheet 30 of 30)

B
MPB Schematic Diagrams

B.1 Introduction

This section contains schematic diagrams for the Extensa 900 Mobile Productivity Base. Logic schematics for the MPB are provided in Appendix A of this manual.

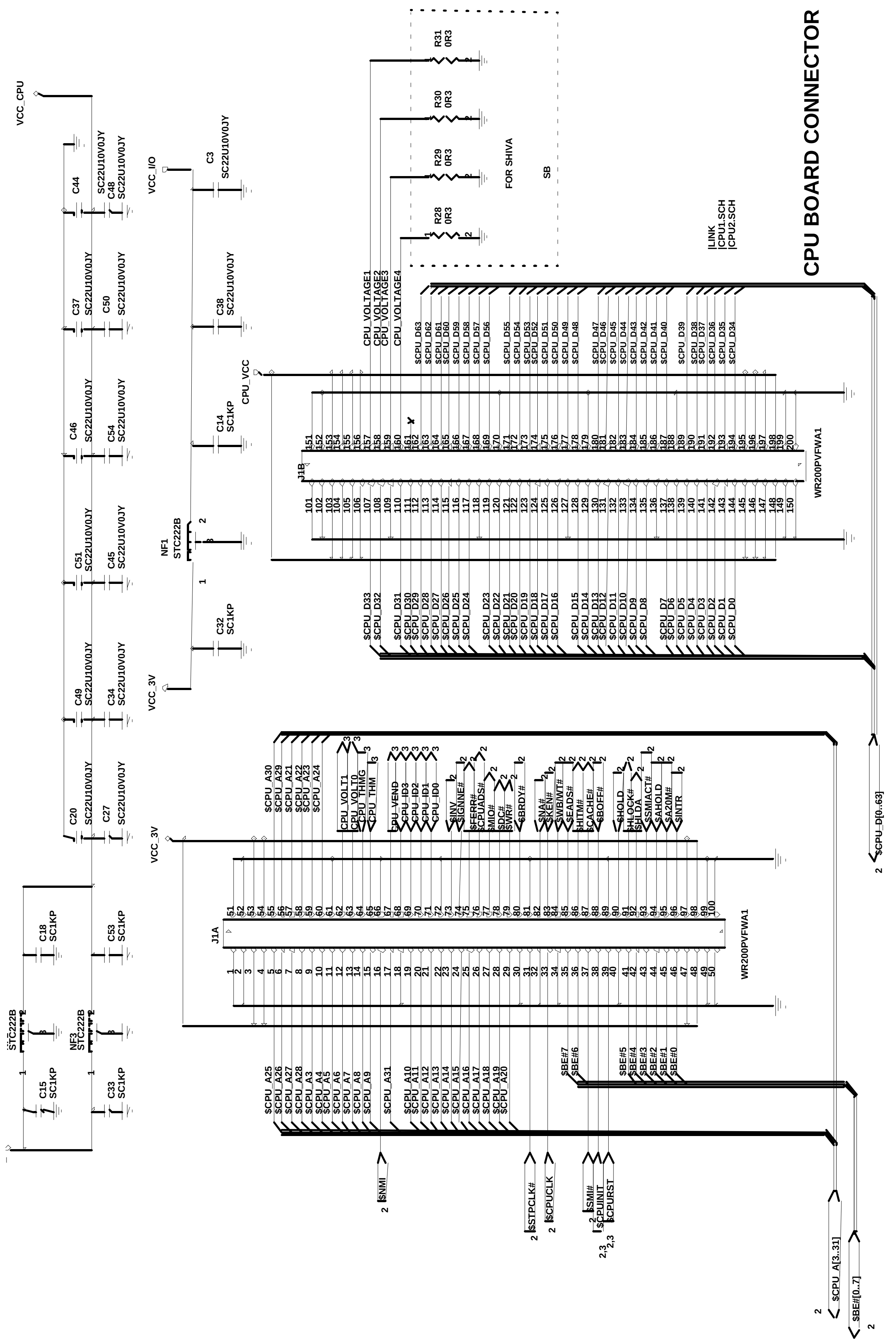


Figure B-1 MPB CPU Board Logic Diagrams (Sheet 1 of 3)

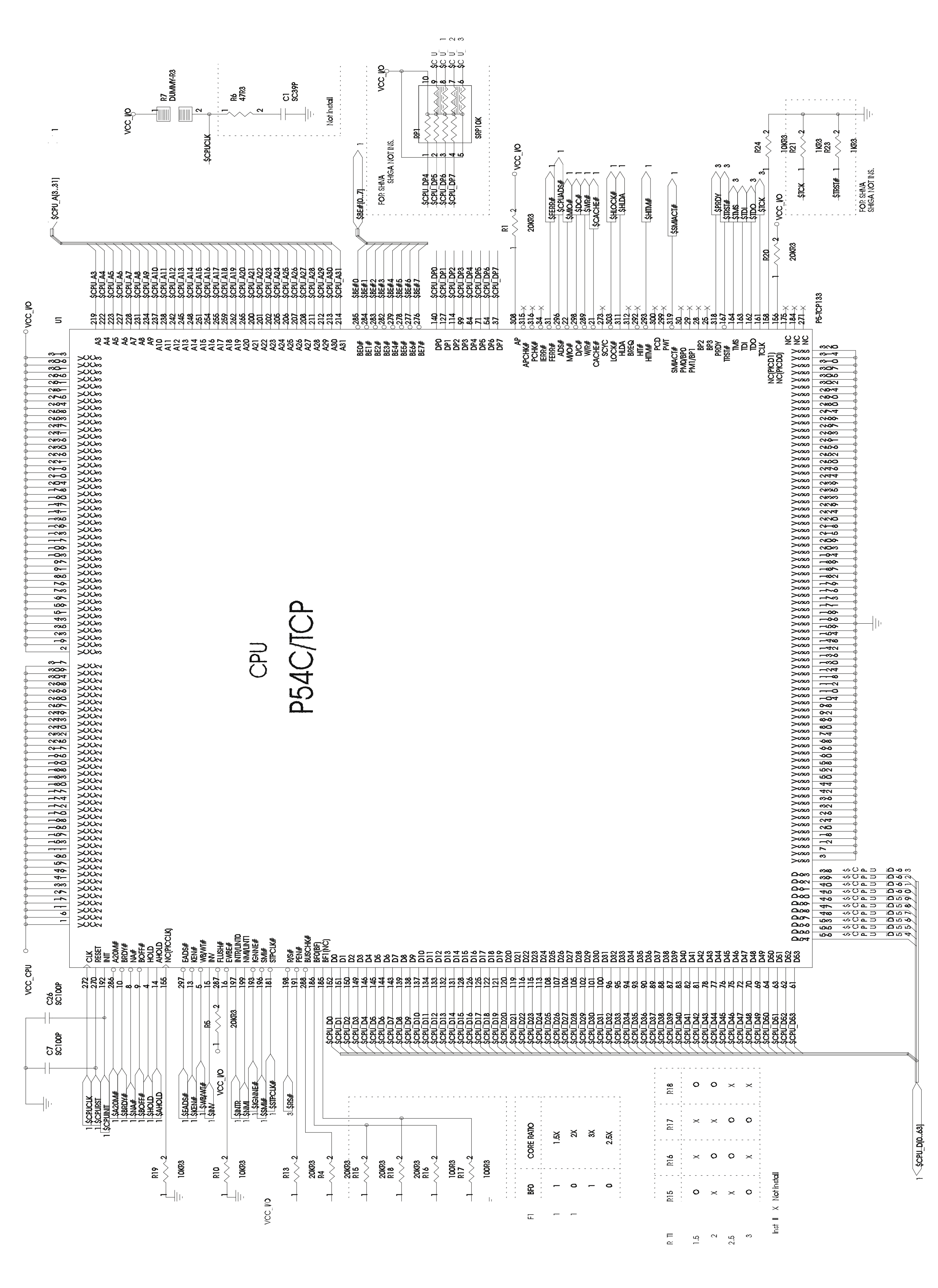
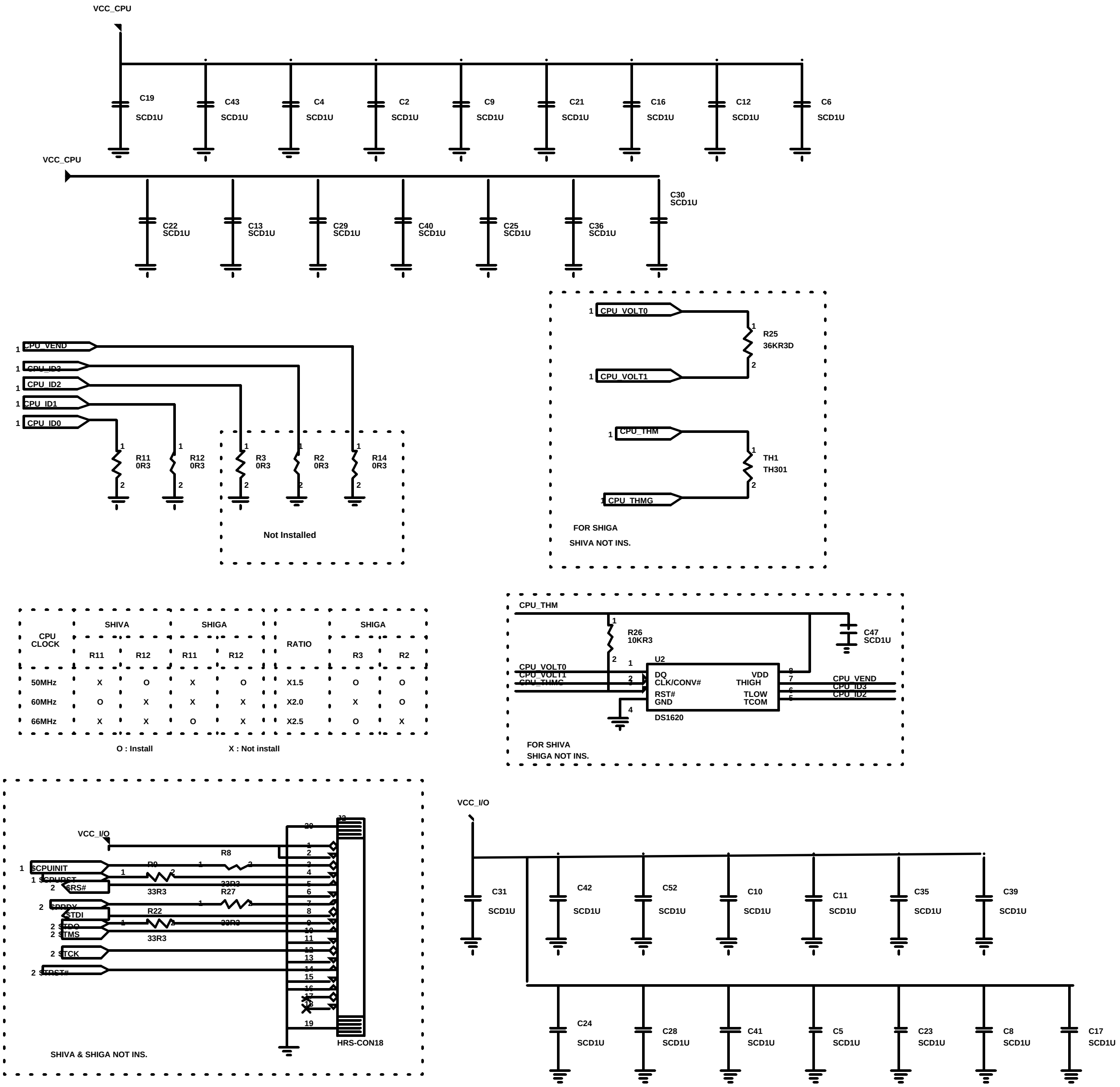


Figure B-1 MPB CPU Board Logic Diagrams (Sheet 2 of 3)



CPU CLOCK	SHIVA R11	SHIVA R12	SHIGA R11	SHIGA R12	RATIO	SHIGA R3	SHIGA R2
50MHz	X	O	X	O	X1.5	O	O
60MHz	O	X	X	X	X2.0	X	O
66MHz	X	X	O	X	X2.5	O	X

O : Install X : Not install

THERMAL SENSOR

Figure B-1 MPB CPU Board Logic Diagrams (Sheet 3 of 3)

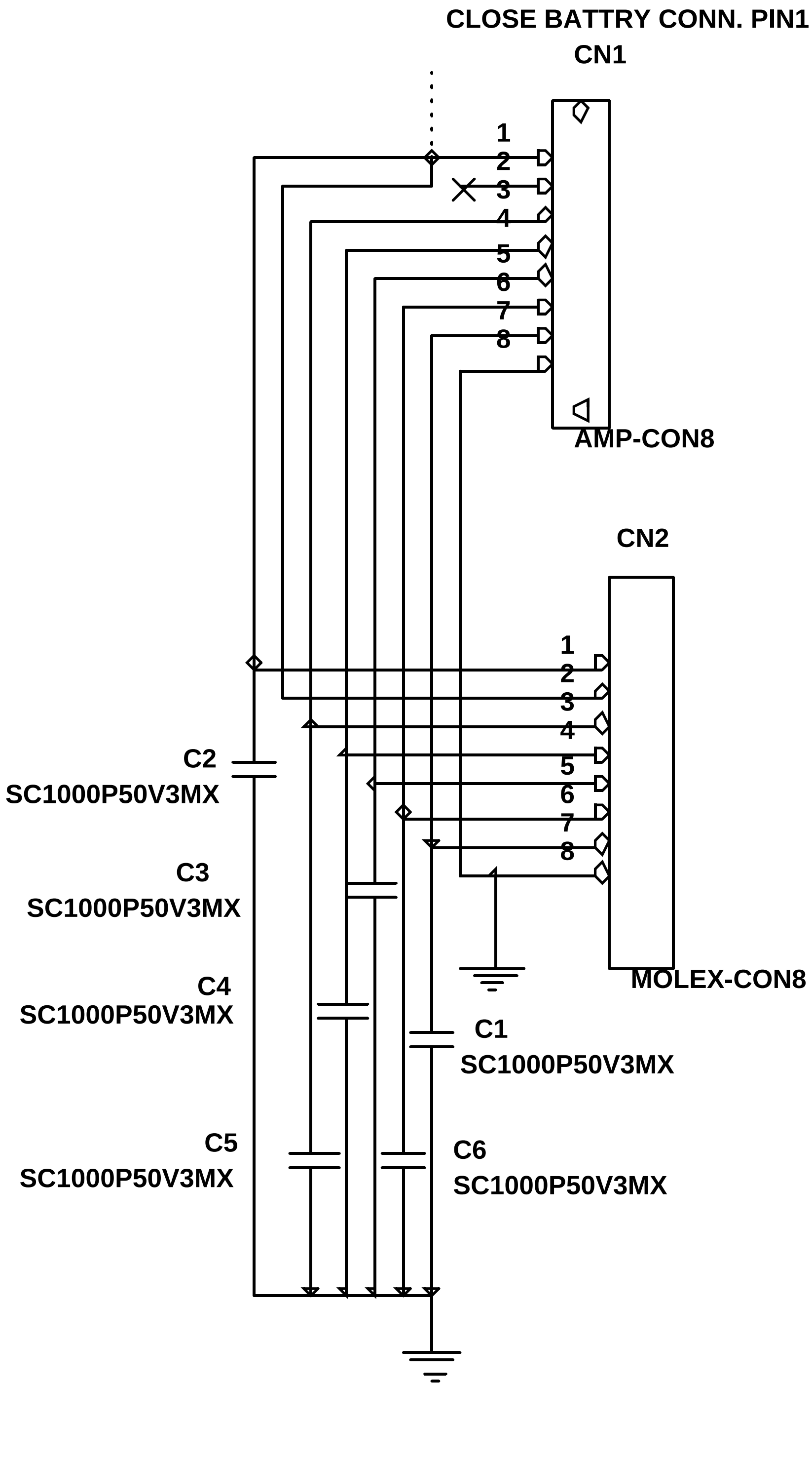


Figure B-2 MPB Battery Board Logic Diagrams (Sheet 1 of 1)

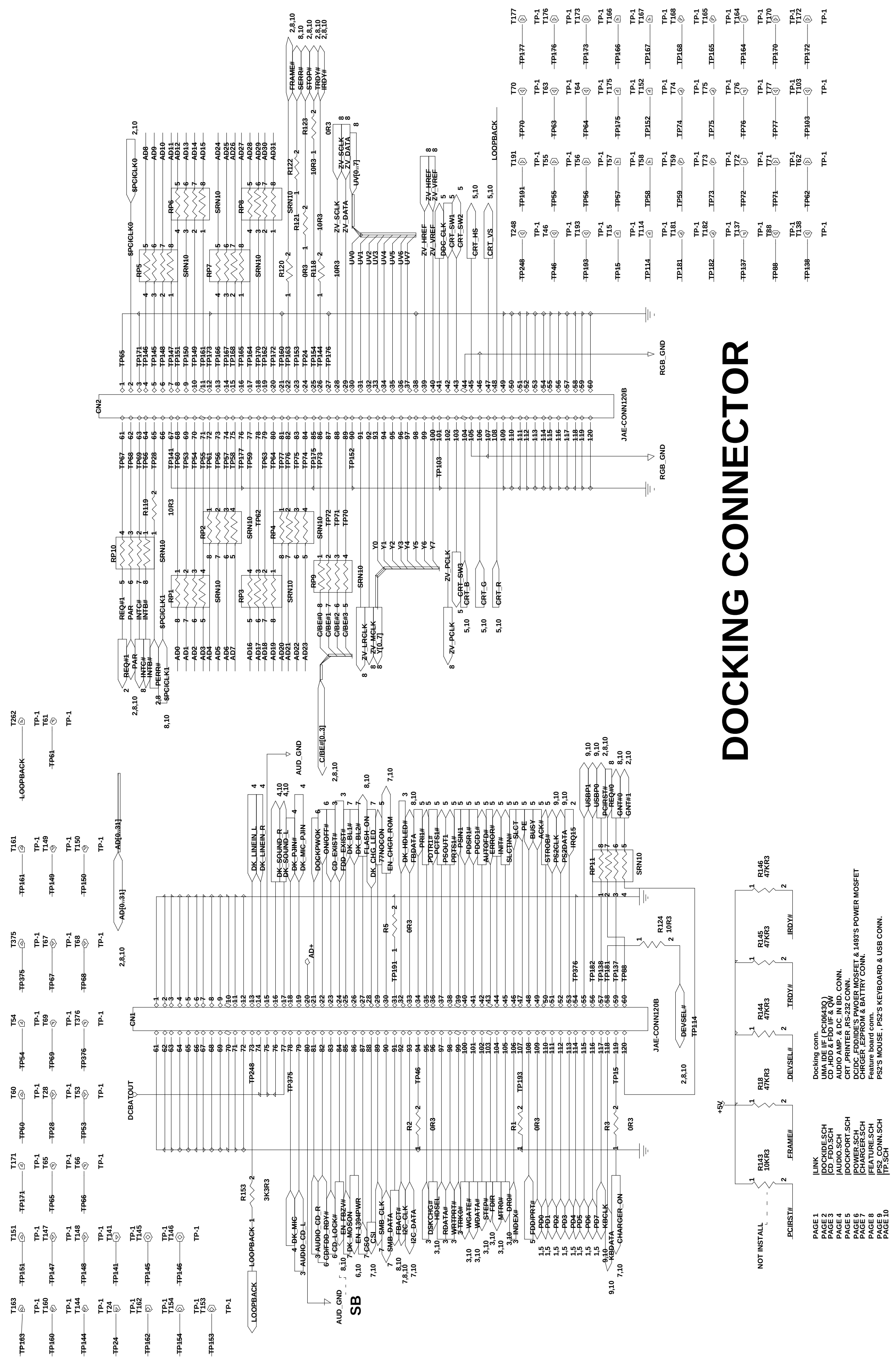


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 1 of 10)

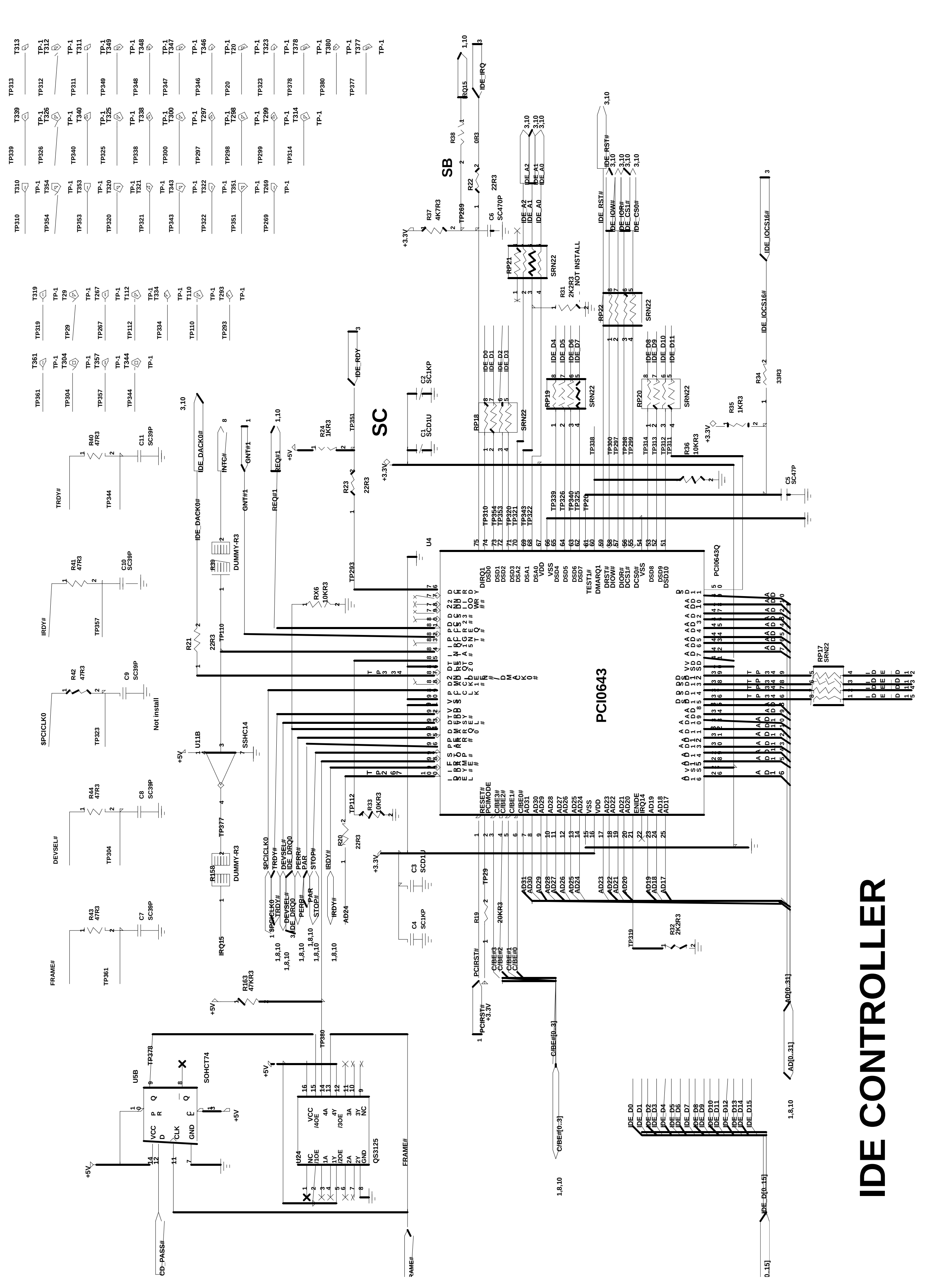


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 2 of 10)

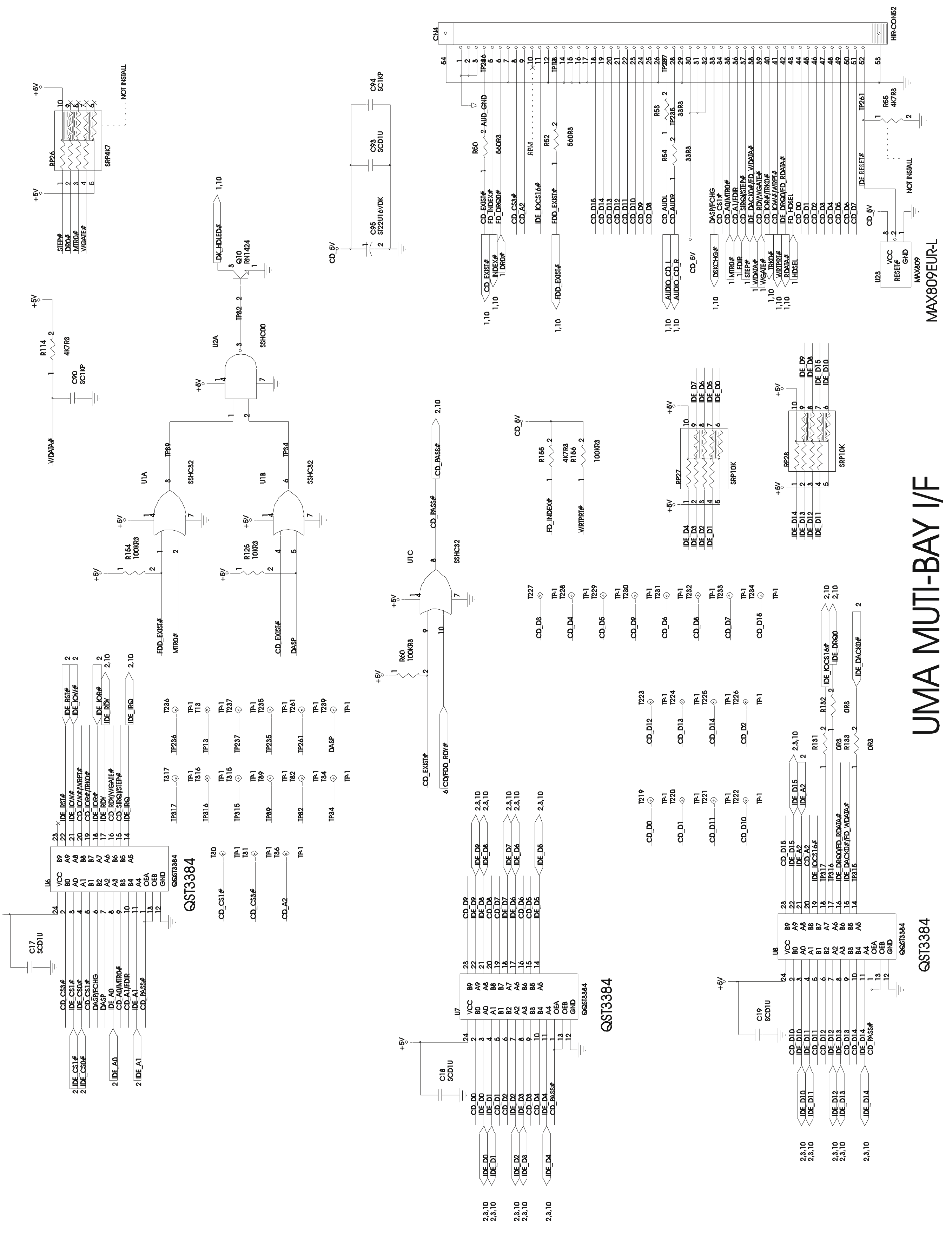
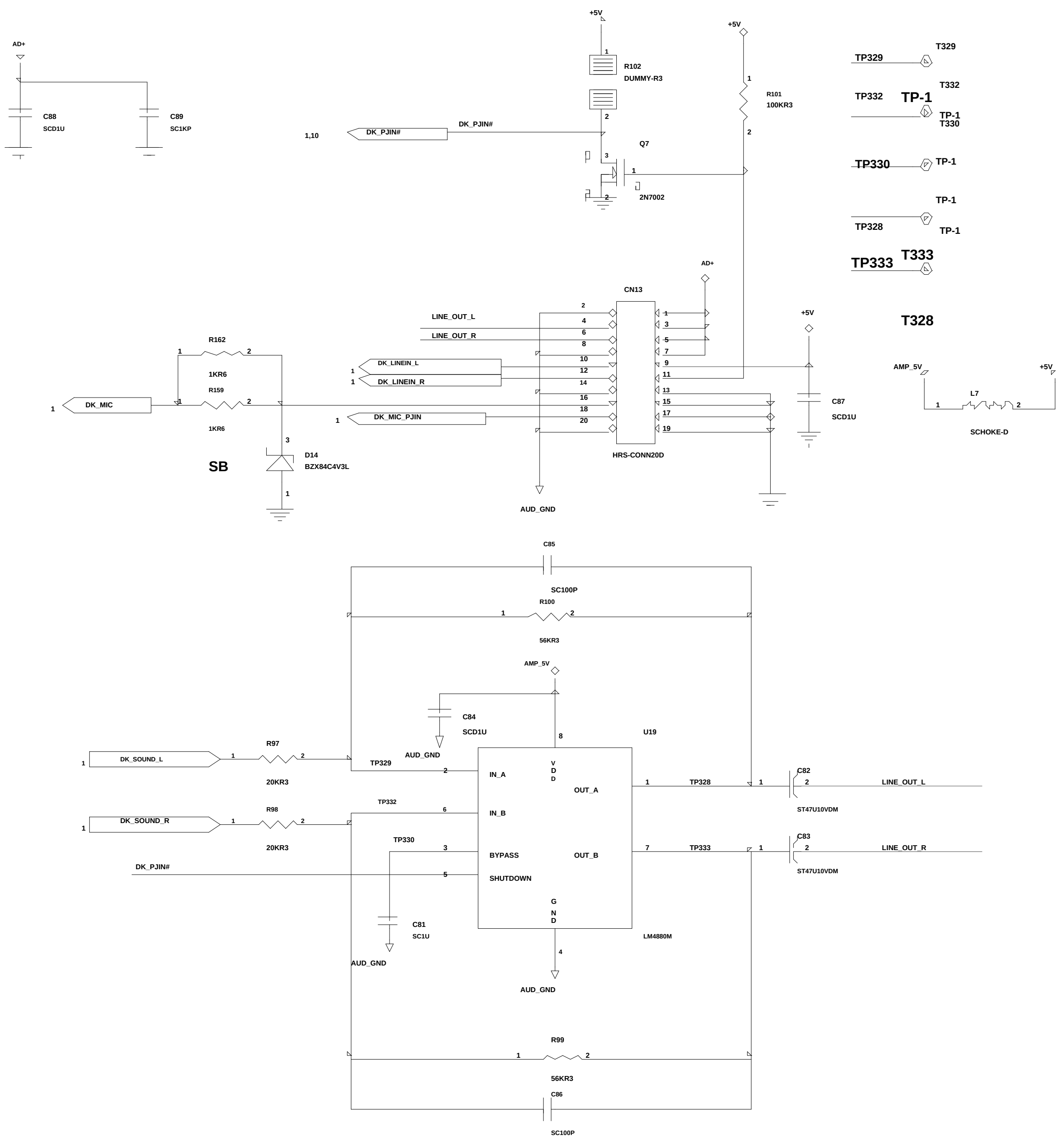


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 3 of 10)



AUDIO AMP.

MPB DC_IN B.D CONN.

Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 4 of 10)

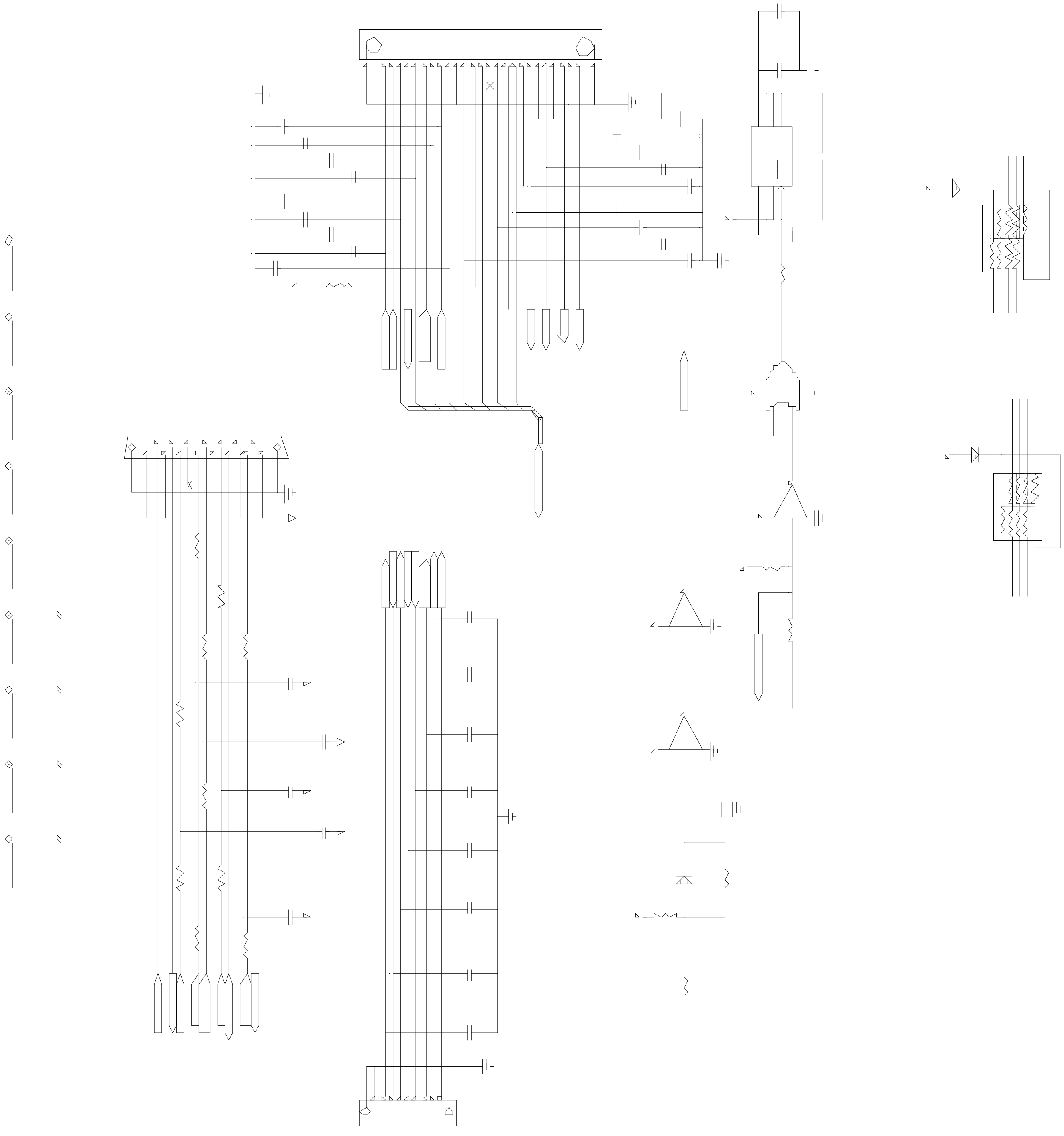


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 5 of 10)

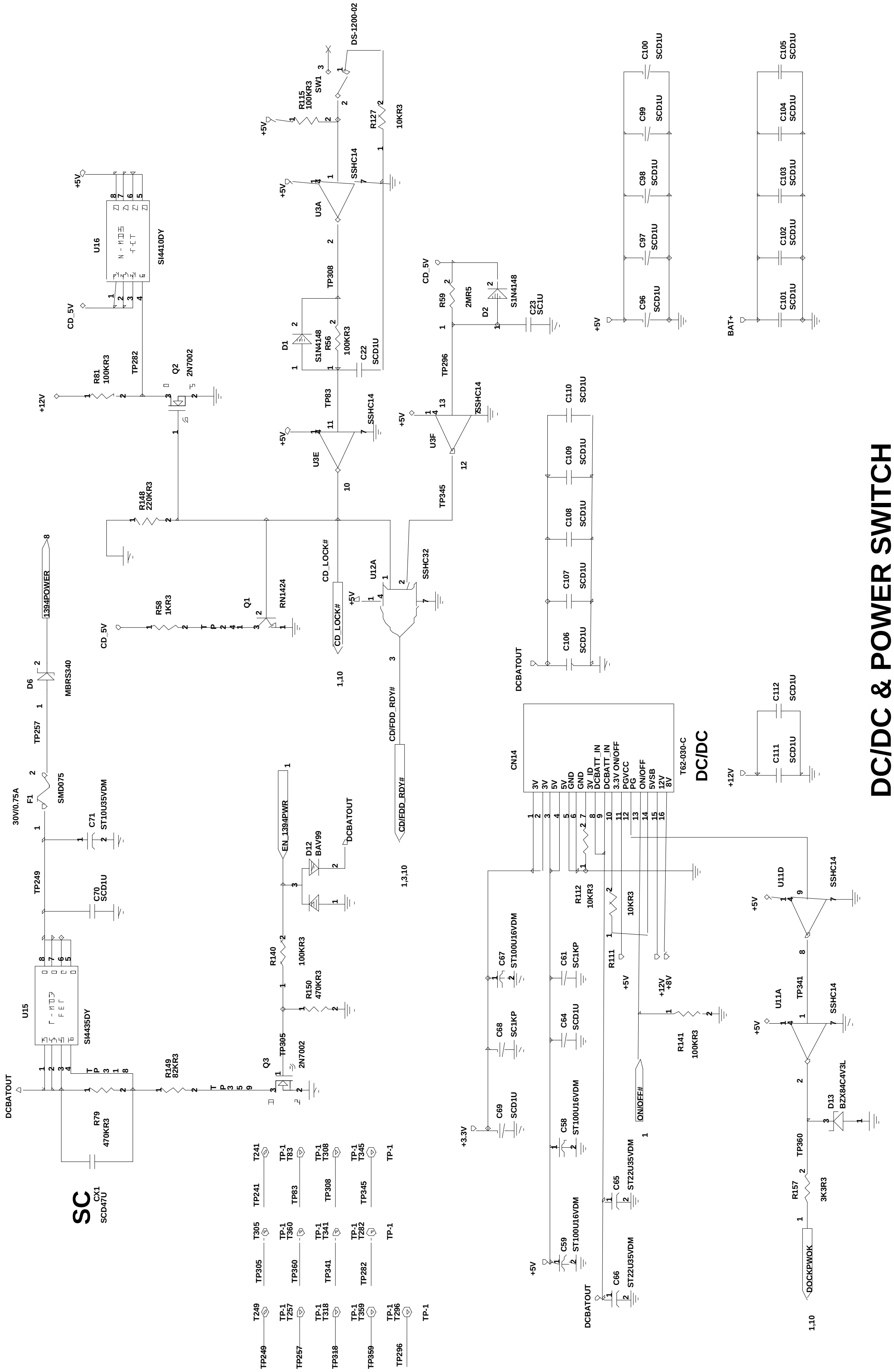


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 6 of 10)

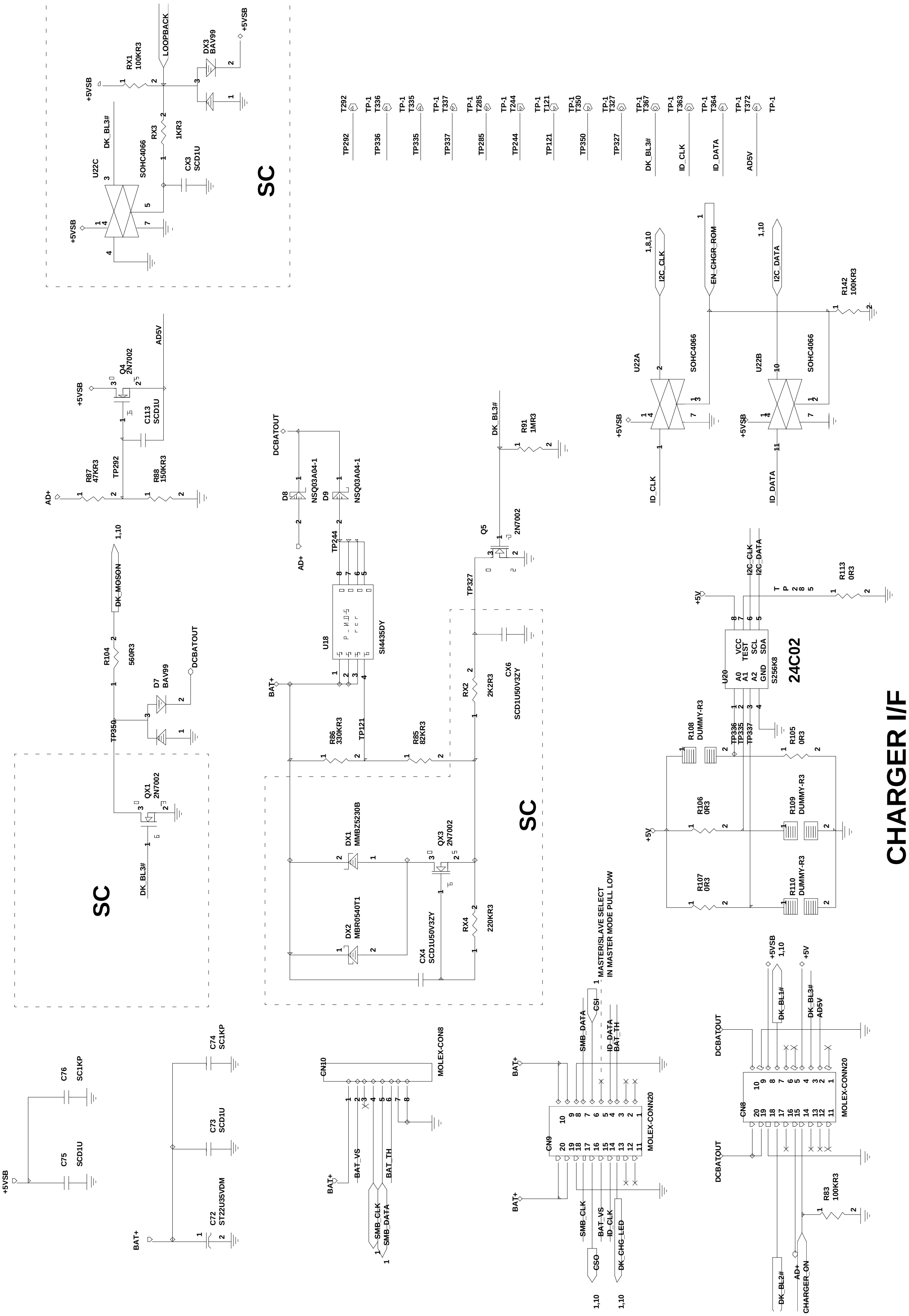


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 7 of 10)

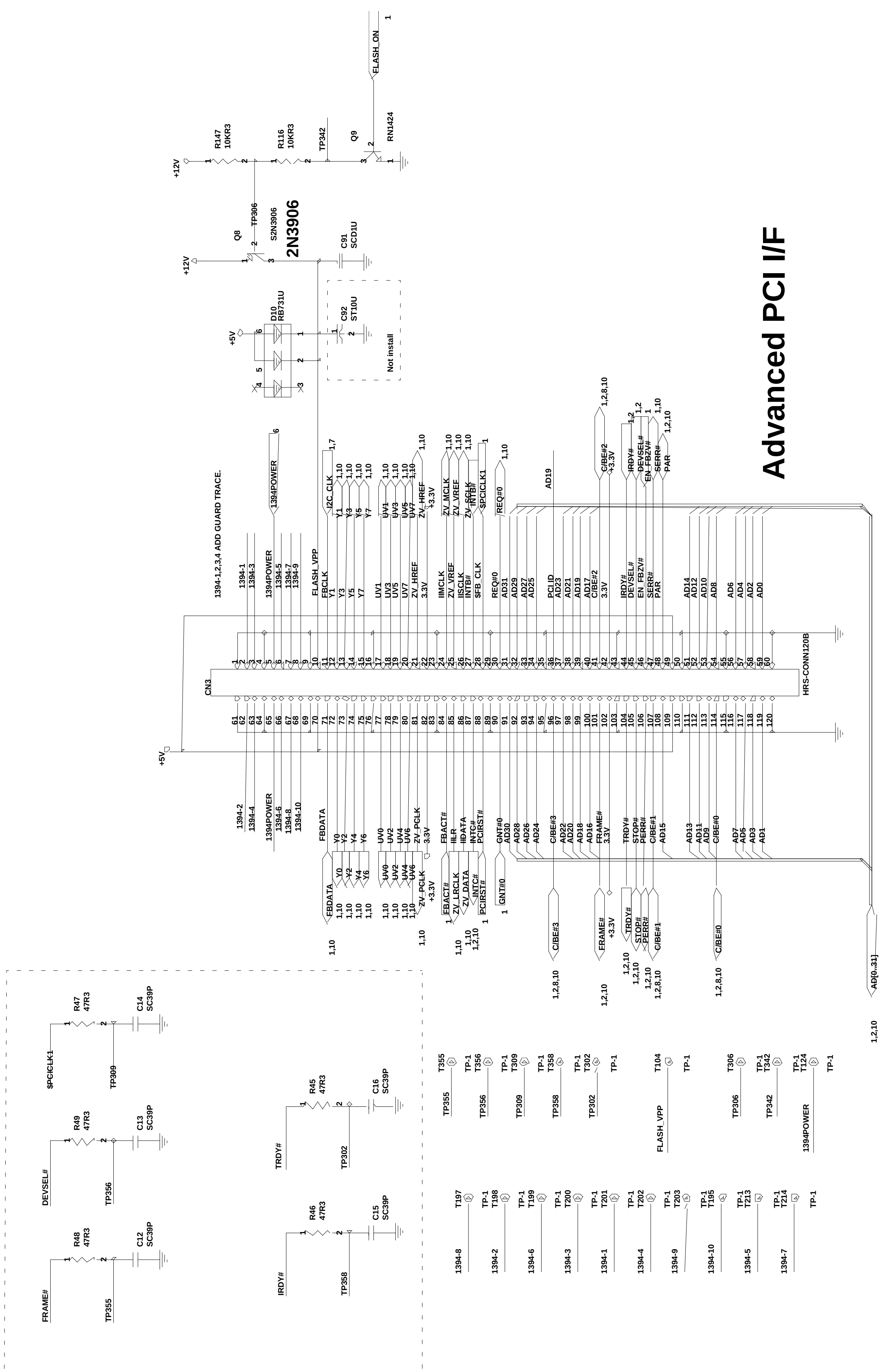


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 8 of 10)

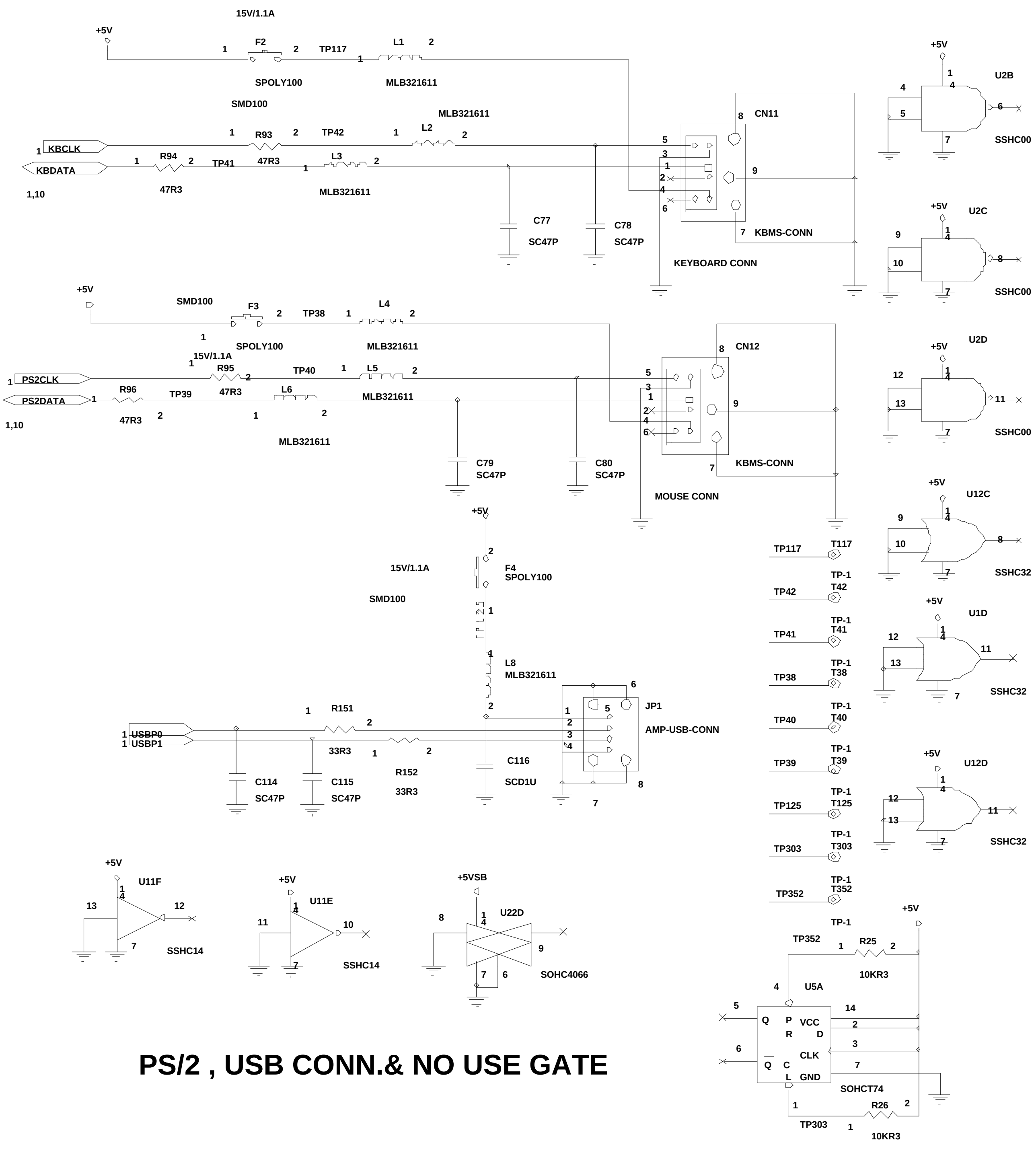


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 9 of 10)

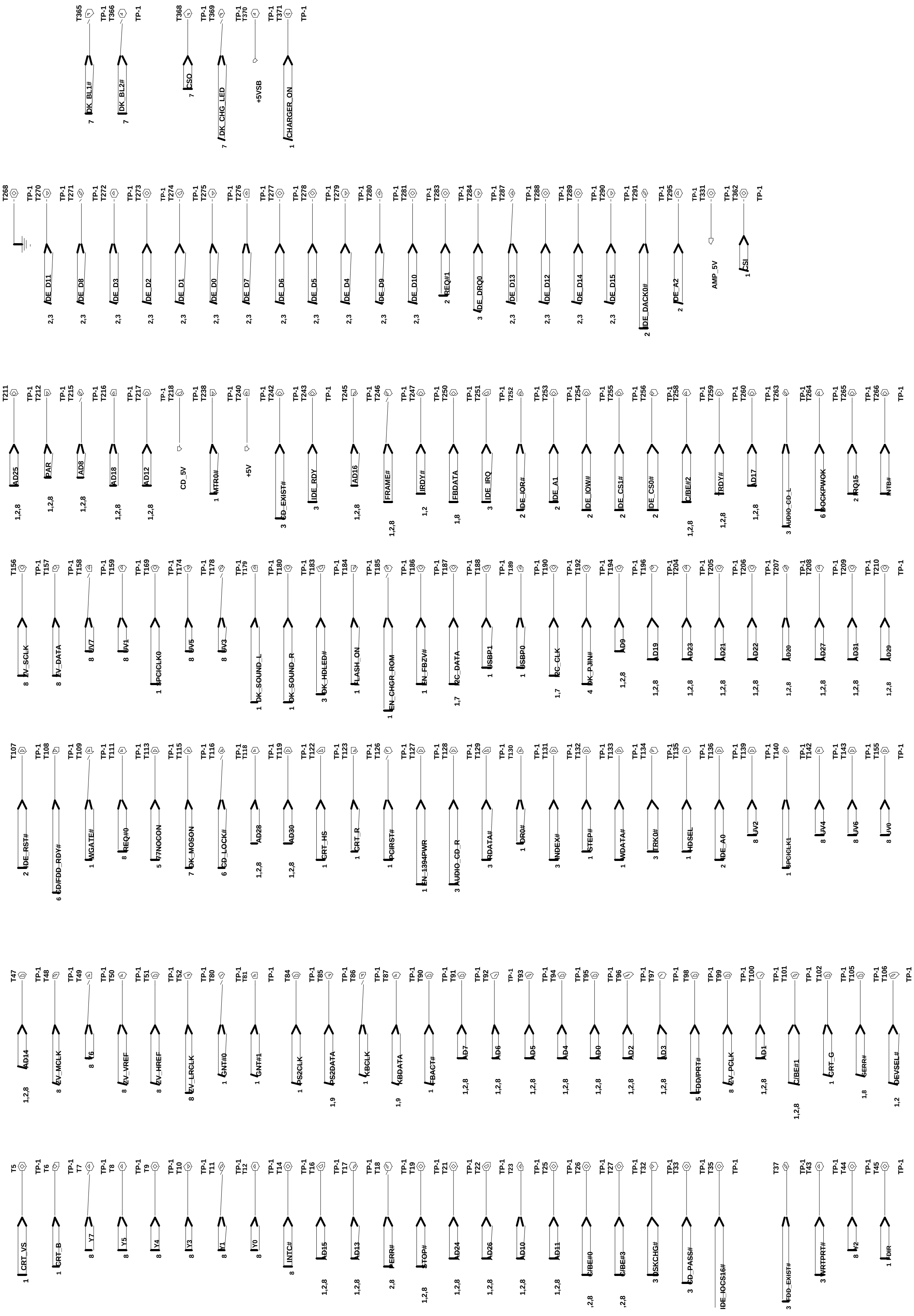


Figure B-3 MPB Main Board (Motherboard) Logic Diagrams (Sheet 10 of 10)

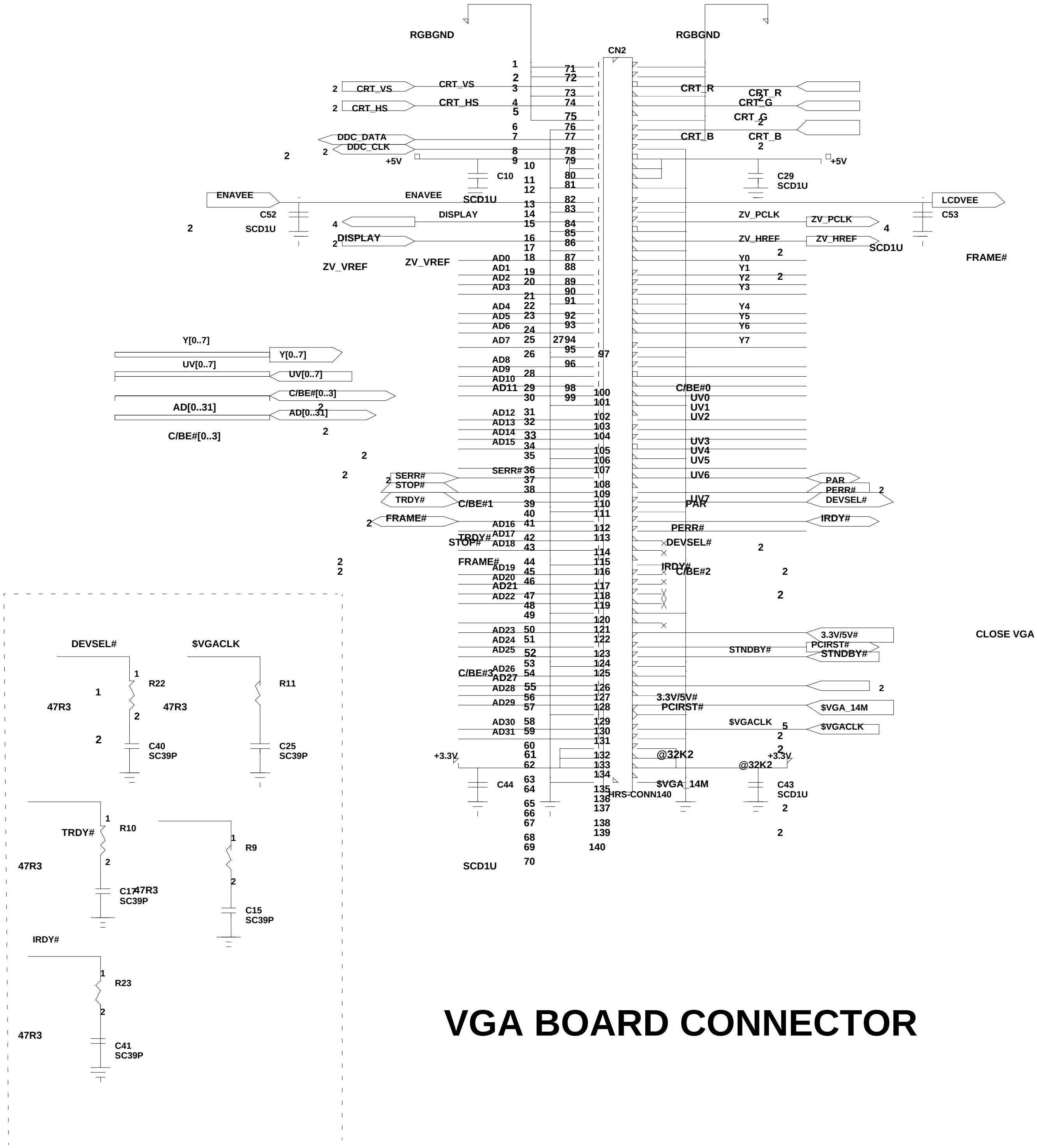


Figure B-4 MPB VGA Board Logic Diagrams (Sheet 1 of 5)

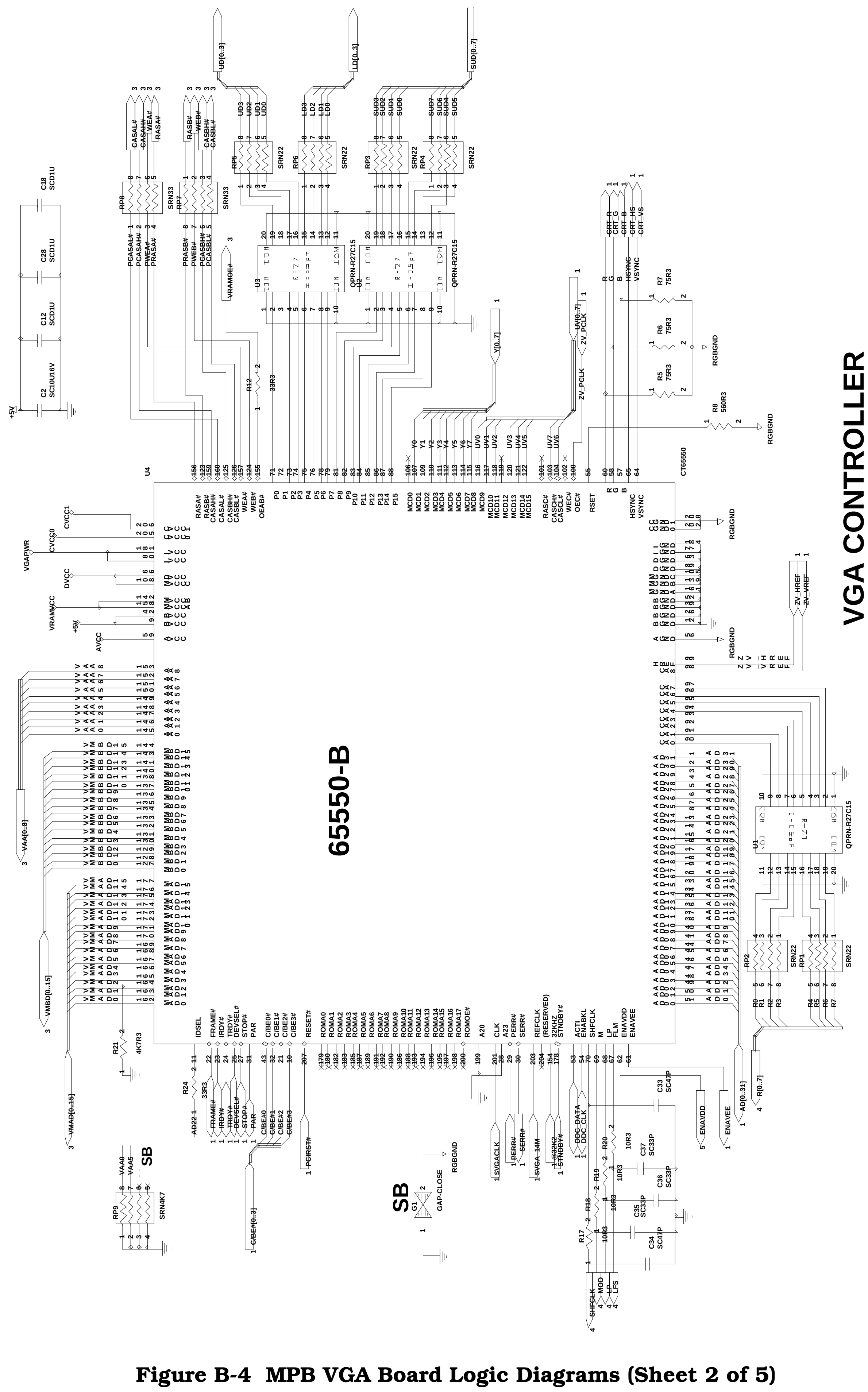


Figure B-4 MPB VGA Board Logic Diagrams (Sheet 2 of 5)

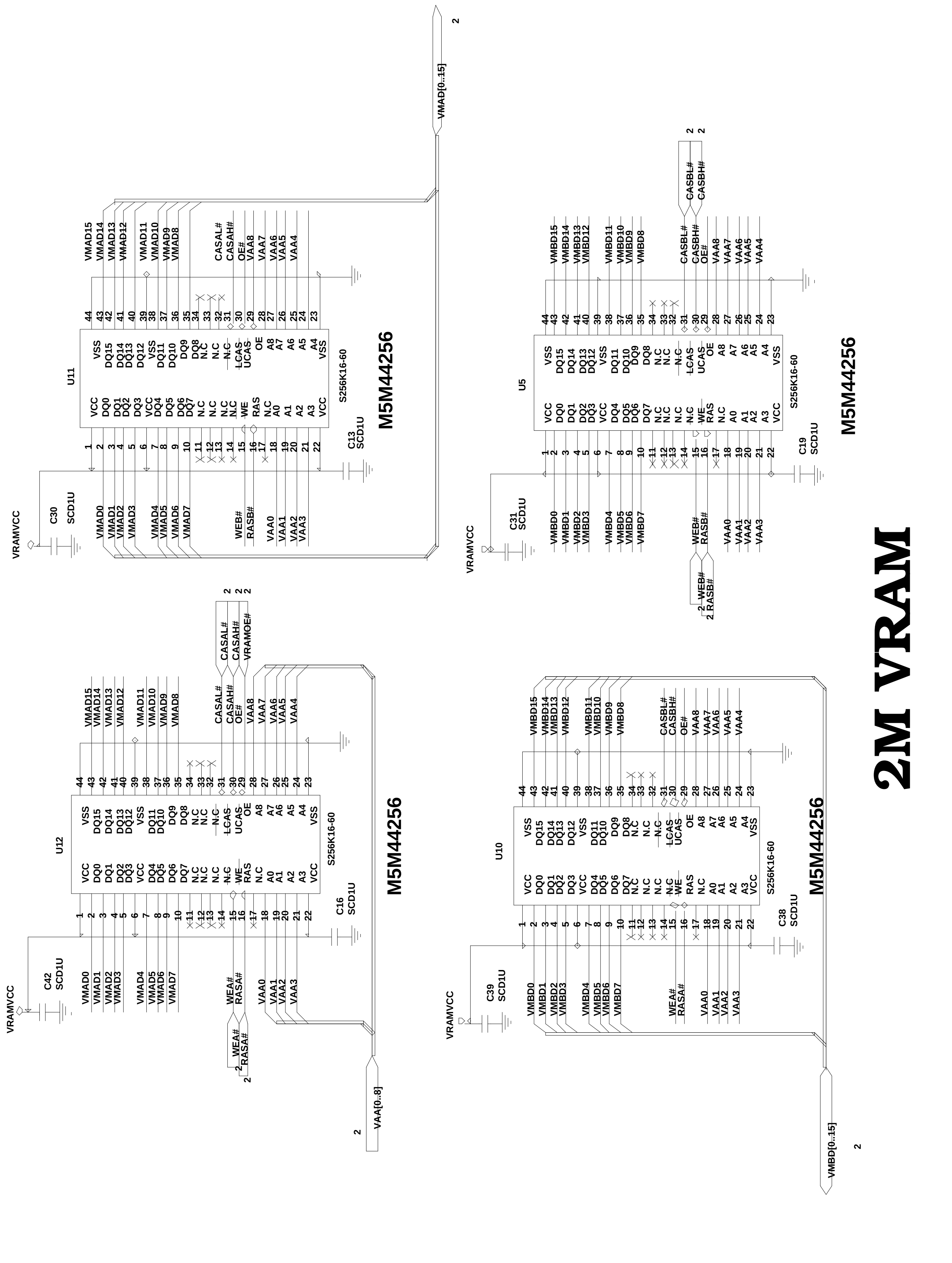


Figure B-4 MPB VGA Board Logic Diagrams (Sheet 3 of 5)

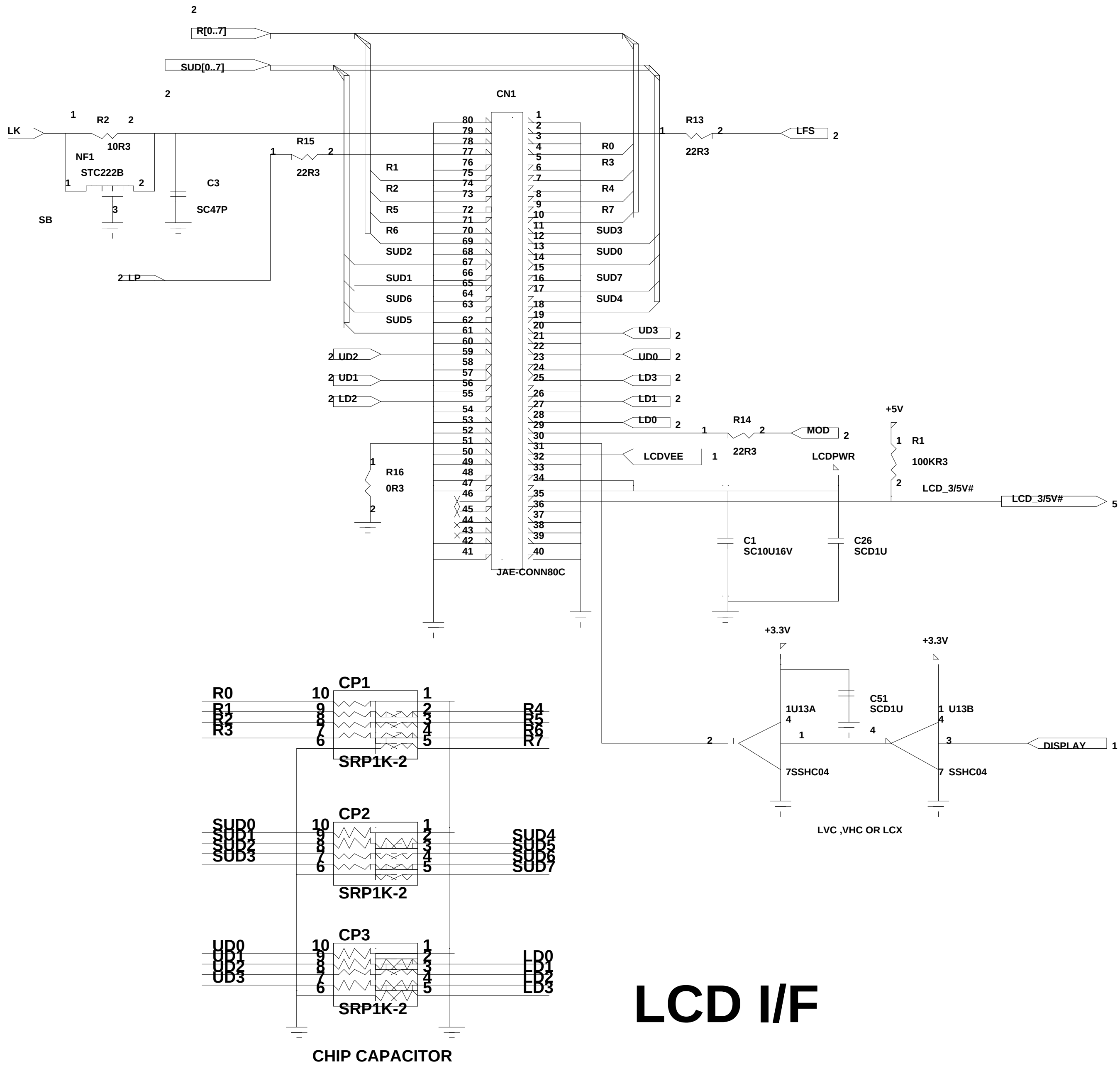


Figure B-4 MPB VGA Board Logic Diagrams (Sheet 4 of 5)

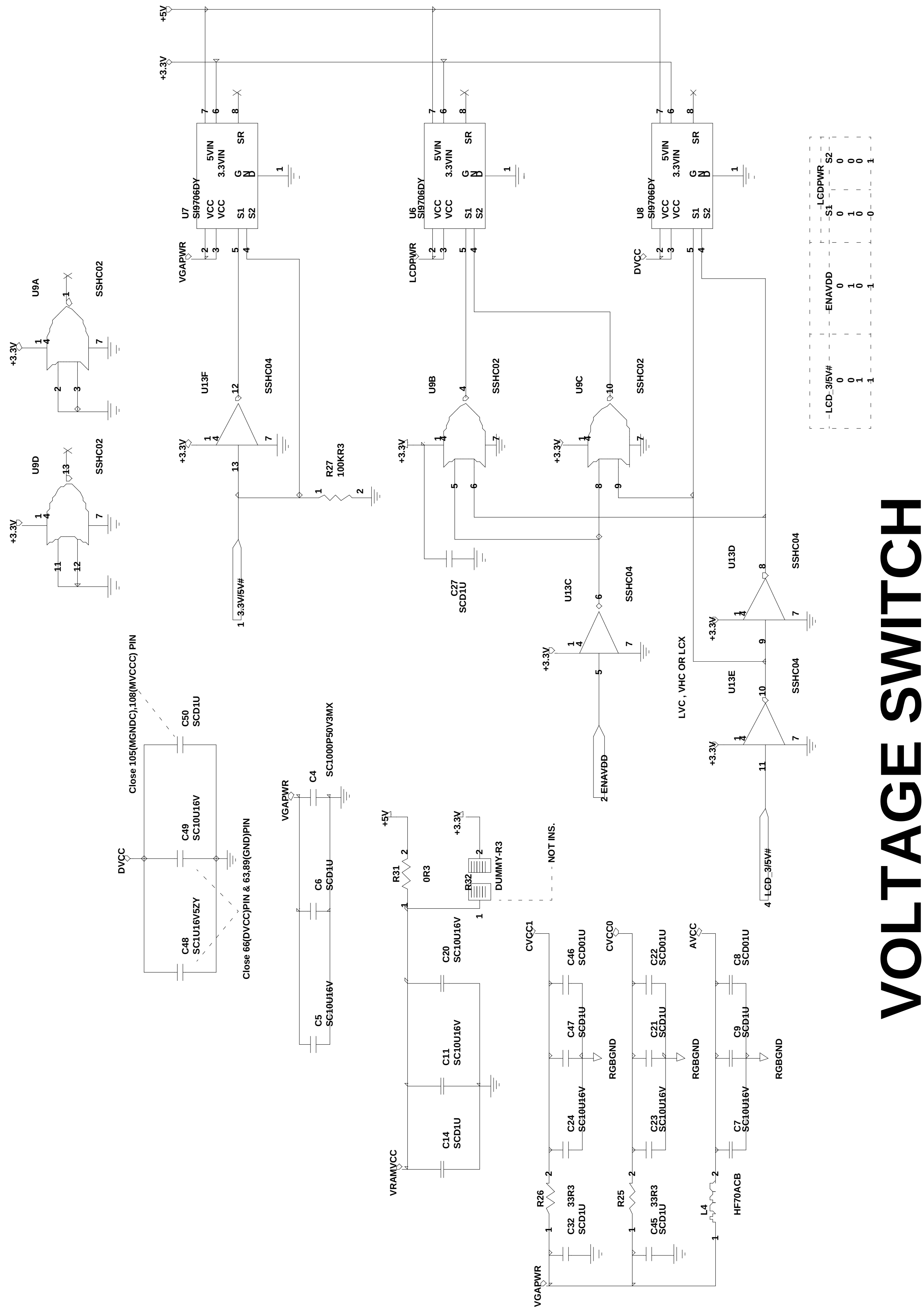


Figure B-4 MPB VGA Board Logic Diagrams (Sheet 5 of 5)

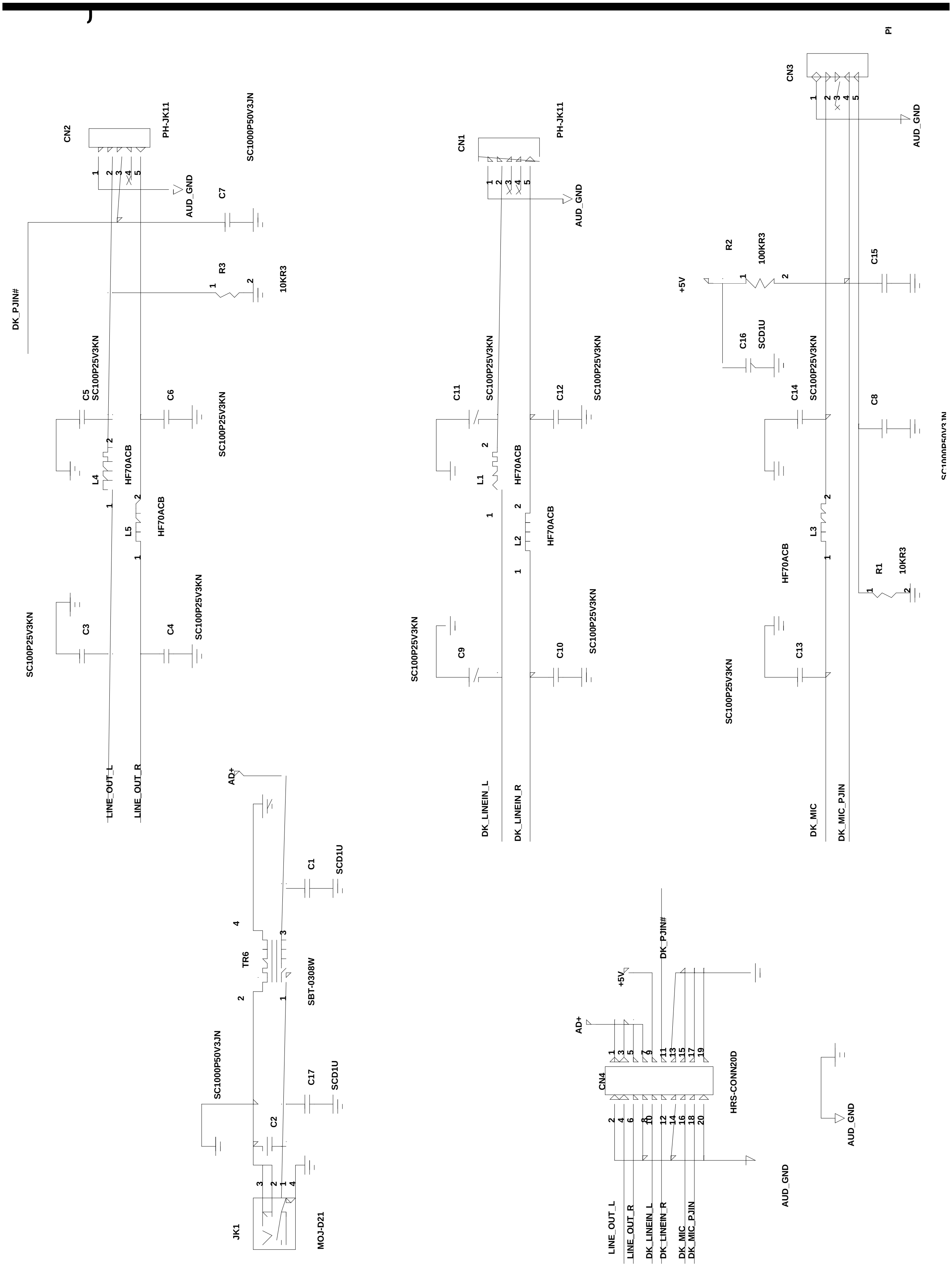


Figure B-5 MPB DC In Board Logic Diagrams (Sheet 1 of 1)

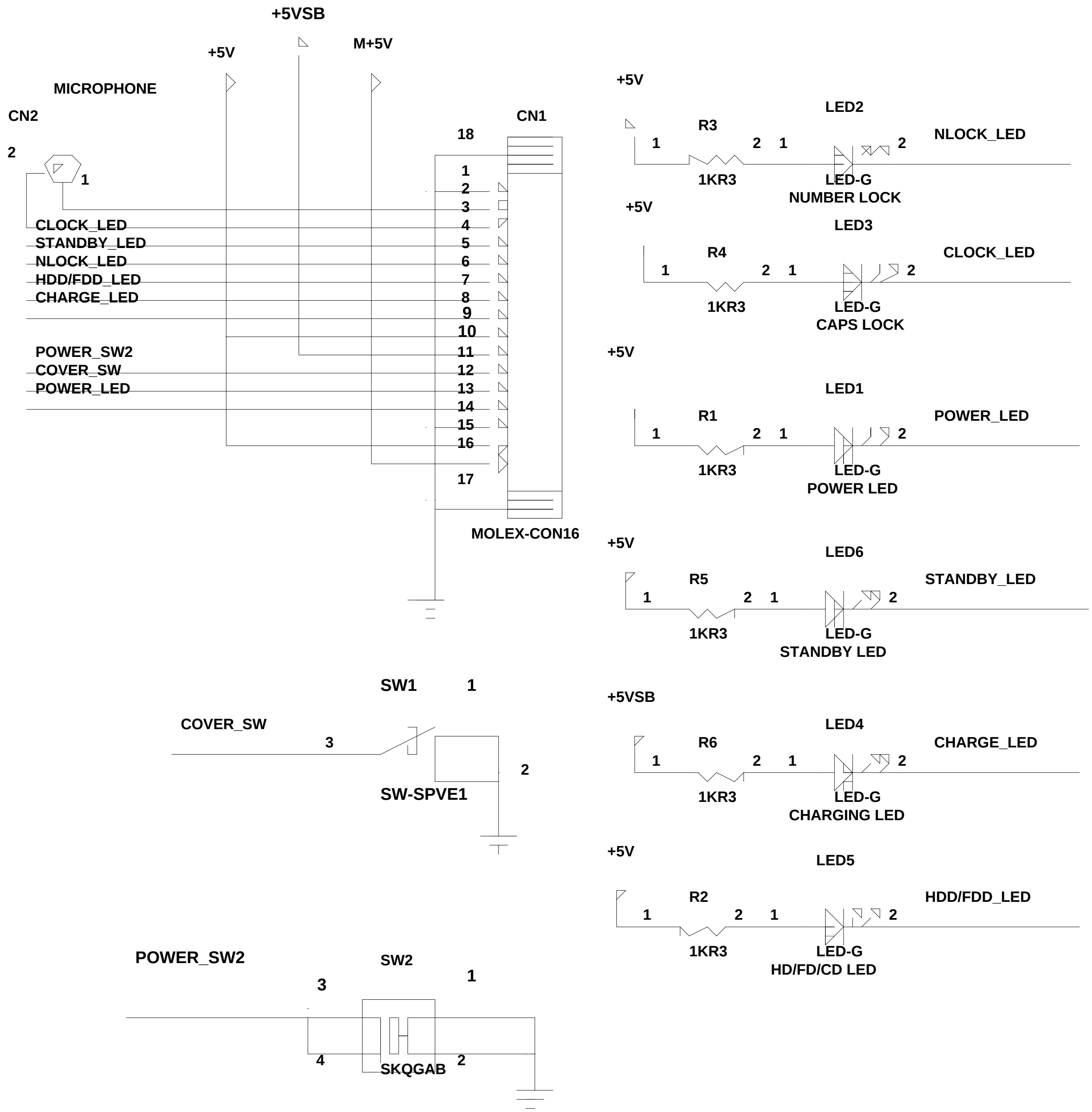


Figure B-6 MPB LED Board Logic Diagrams (Sheet 1 of 1)

C POST BIOS

C.1 Introduction

This section contains a listing of the POST BIOS calls for the Extensa 900 Series Notebook.

```
;---------------------------------------------------------------------------
; Make sure we entered POST in real mode
; Determine the CPU type
; Convert all segment limits to 4GB
;---------------------------------------------------------------------------
002H   post Verify Real Mode
004H   cpu Get Type J
006H   post Hardware Initialize
024H   postSetHugeESJ
```

```
;---------------------------------------------------------------------------
; Initialize the chipset
; Set the in-POST flag
; Autosize the RAM
; Clear the base RAM
; Test the base RAM
; Autosize the cache
; Shadow the BIOS
;---------------------------------------------------------------------------
008H   cs Initialize
011H   post Reg Initialize J
00EH   io Initialize OPTIONAL
00CH   cache Initialize
016H   post Checksum Test
018H   post Timer Init
017H   cache Pre Ram Auto size, OPTIONAL
028H   cs Ram Auto size
03AH   cache Auto size
02AH   post Zero Base Ram
02CH   post Real Address Test
030H   post Base Ram Test
02FH   cache Pre Sys Shadow OPTIONAL
038H   cs System Shadow Config
020H   post Refresh Test, FAR
009H   post Set In Post Flag, FAR
```

```
;---------------------------------------------------------------------------
; Initialize all the hardware to a known state
;---------------------------------------------------------------------------
00AH   cpu Initialize
00BH   cpu Cache On
00FH   fdiskInitializeJ
010H   pmInitializeJ, OPTIONAL
```

```
;---------------------------------------------------------------------------
; Perform hardware tests, and further initialization
;---------------------------------------------------------------------------
014H   post I8742 Init, FAR
```

```
01AH   post Dma InitJ, FAR
01CH   post Reset PIC

;---------------------------------------------------------------------------
; Test the keyboard controller
; Compute the CPU clock speed
; Test the CMOS RAM
;---------------------------------------------------------------------------
022H   post I8742 Test, FAR
032H   post Compute Speed, FAR
034H   post Cmos Test, FAR

;---------------------------------------------------------------------------
; Optimize chipset timing
; Optimize other hardware
;---------------------------------------------------------------------------
03CH   cs Adv Config
03DH   post Adv Reg Config, OPTIONAL

;---------------------------------------------------------------------------
; Initialize interrupt vectors
; Make sure ROM copyright notice is intact
; Check for configuration errors
; Initialize the video
; Shadow the video
; Display the copyright notice
; Display the CPU type
; Initialize EISA bus
; Set segment limits back to 4GB (PCI code may have changed them)
;---------------------------------------------------------------------------
042H   post Vector Init, FAR
046H   post Copyright Check, FAR
047H   pci Op Rom Init
049H   pci Init
048H   post Config Check, FAR
04AH   pci Video Init
04CH   cs Video Shadow Config
024H   postSetHugeESJ

;---------------------------------------------------------------------------
; Test and initialize the keyboard
; Check for unexpected interrupts
; Display prompt "Press F2 to enter SETUP"
;---------------------------------------------------------------------------
052H   post KB Test, FAR
054H   feat Setup Keyclick, OPTIONAL, FAR
076H   post Keyboard Test, FAR
058H   post Hot Interrupt Test, FAR

;---------------------------------------------------------------------------
; Initialize QuietBoot if it's installed
;   Note: Both the keyboard and timer interrupts (IRQ0 and IRQ1) are enabled
;         here.  Also, interrupts are enabled here and run through the end
;         of POST.  If your POST task requires interrupts to be off, please
;         preserve them by doing a PUSHF, CLI at the beginning and a POPF at
;         the end.  If you change the PIC, please preserve existing bits.
; Display the copyright notice
; Display the CPU type
; Initialize EISA bus
```

```
; Display prompt "Press F2 to enter SETUP"
;------------------------------------------------------------------------
04BH   quiet Boot Start, OPTIONAL, FAR
04EH   post Copyright Display, FAR
050H   cpu Display, FAR
051H   eisa Init, OPTIONAL
05AH   post Display F2 Message, FAR

;------------------------------------------------------------------------
; Disable the CPU cache
; Size and test the system memory
; Size and test the extended memory
; Test extended memory address lines
; User hook # 1
;------------------------------------------------------------------------
05BH   cpu Cache Off
05CH   post Memory Test, FAR
060H   post Extended Memory Test, FAR
062H   post Extended Address Test, FAR
064H   user Patch1

;------------------------------------------------------------------------
; Enable and configure the cache
; Display the cache size if a cache was detected and enabled.
; Display size of shadow RAM, size of non-disposable BIOS
;------------------------------------------------------------------------
066H   cache Adv Config
068H   cache Configure
06AH   post Display Cache Size, FAR
06CH   post Display Shadows, FAR
06EH   post Display Non Disposable, FAR

;------------------------------------------------------------------------
; Display any POST errors
; Check for configuration errors
; Test Real Time Clock
; Check for keyboard errors
;------------------------------------------------------------------------
070H   post Display Error Messages, FAR
072H   post Test Config, FAR
074H   post RTC Test, FAR

;------------------------------------------------------------------------
; Set up hardware interrupt vectors
; Test coprocessor if present
; Return to standard real mode
;------------------------------------------------------------------------
07CH   post Setup Hardware Vectors, FAR
07EH   cpu Coprocessor Test, FAR
096H   post Clear Huge ES

;------------------------------------------------------------------------
; Disable programmable I/O devices
; Detect and install fixed RS232 ports
; Detect and install fixed parallel ports
; Init PC-compatible PNP & PCI devices (COM, LPT, floppy, etc.)
; Re-enable programmable I/O and check for conflicts with fixed I/O
;------------------------------------------------------------------------
post Shutdown Eight Table LABEL post Proc
```

```
094H   post Disable A20, FAR
080H   io Before Init, OPTIONAL
085H   pci Init Pcc, OPTIONAL
082H   io RS232 Test Code
084H   io Parallel Test Code
086H   io After Init

;--------------------------------------------------------------------------
; Initialize Bios Data Area and Extended Bios Data Area
; Initialize hard and floppy disk controllers
; Initialize MP Environment
;--------------------------------------------------------------------------


088H   post Bios Init, FAR
08CH   post Floppy Test, FAR
090H   fdisk Post Test, FAR
08AH   post Init Ext BDAJ, FAR
08BH   feat Mouse Test, OPTIONAL, FAR
095H   hdd CD Test, OPTIONAL, FAR
093H   mp Init, OPTIONAL
092H   user Patch2

;--------------------------------------------------------------------------
; Scan for BIOS ROM extensions
;--------------------------------------------------------------------------
098H   pci Rom Area Check

;--------------------------------------------------------------------------
; Set up Power Management
; Enable hardware interrupts
; Set time
; Check for key lock
; Init typematic rate
;--------------------------------------------------------------------------
09CH   pm Setup, OPTIONAL
09EH   post Enable IRQs, FAR
0A0H   post Set Time Of Day, FAR
0A2H   post Key Lock Test, FAR
0A4H   feat Init Keyboard Rate, OPTIONAL, FAR

;--------------------------------------------------------------------------
; Erase F2 prompt
; Check to see if F2 key was pressed
; Optionally print "Press F1 or F2" prompt, and/or enter SETUP
;--------------------------------------------------------------------------
0A8H   post Erase F2 Msg, FAR
0AAH   post Scan For F2, FAR
0ACH   post Setup Check, FAR

;--------------------------------------------------------------------------
; Clear the In Post flag
; Check for errors
; Prepare to boot
; Beep once
; Optionally check password
;--------------------------------------------------------------------------
0AEH   post Clear Boot Flag, FAR
```

```
0B0H  post Error Check, FAR
0B2H  post Done, FAR
0B4H  post One Beep, FAR
0B5H  quiet Boot End, OPTIONAL, FAR
0B6H  feat Check Password, OPTIONAL, FAR
;---------------------------------------------------------------------------
; Shutdown 4 is a boot retry
;---------------------------------------------------------------------------
post Shutdown Four TableLABELpost Proc
;---------------------------------------------------------------------------
;Clear parity checkers
;Optionally clear the screen
;Optionally display any reminder messages
;Try to boot via INT 19
;---------------------------------------------------------------------------
0BCH  post Clear Parity, FAR
0BAH  post DMI Config, OPTIONAL, FAR
0BDH  feat Boot Menu, OPTIONAL, FAR
0BBH  pnp Oprom InitBCVs, OPTIONAL, FAR
0BEH  post Clear Screen, FAR
0BFH  post Check Reminders, OPTIONAL, FAR
08FH  fdisk Pre Fast Init, OPTIONAL
091H  fdisk Fast Init, OPTIONAL
09FH  fdisk Rest Fast Init, OPTIONAL
097H  post Mp Fix Up Table, OPTIONAL
0C0H  postInt19

postSegment ENDS
```

TEXAS INSTRUMENTS